Project Galileo

Software Interface Specification

Solid State Imaging Raw Experiment Data Record Compact Disc - Read Only Memory (SSI REDR CD-ROM)

SIS 232-16

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July 20, 1993

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PROJECT GALILEO

SOFTWARE INTERFACE SPECIFICATION

COVER SHEET

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NUMBER: SIS 232-16

UPDATE

DATE: July 20, 1993

SIS NAME:

Solid State Imaging Raw Experiment Data Record Compact-Disc Read Only Memory (SSI REDR CD-ROM)

DOMAIN:

System	Subsystem	Program	Make / Use
MIPL	Realtime	GIMBUILD, SSIMERGE, CATLABEL, BADLABELS, GLLFILLIN, GLLBLEMCOR, ADESPIKE	Make
MIPL	Systematic	CATPRODUCTS, CATCD, CDGEN, DISCARCHITECT	Make

PURPOSE OF INTERFACE (SUMMARY):

This interface describes the content and format of the SSI REDR CD-ROM

INTERFACE MEDIUM:

Compact Disc - Read Only Memory (CD-ROM)

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PROJECT GALILEO

SOFTWARE INTERFACE SPECIFICATION

DISTRIBUTION

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NUMBER: SIS 232-16

UPDATE

DATE: July 20, 1993

SIS NAME:

Solid State Imaging Raw Experiment Data Record Compact-Disc Read Only Memory (SSI REDR CD-ROM)

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Document Change Log

Change Order	Date	Affected Portions
Original	April 10, 1992	All
Update	July 20, 1993	Removed all references to EDRs, updated PDS label information and updated entire Appendix A. See change bars.

TBD Items

Page	Closure Date	Item Description
none		

ACRONYMS & ABBREVIATIONS

ASCII........................American Standard Code for Information Interchange
CCT........................Computer Compatible Tape
CD..........................Compact Disc
CD-ROM.................Compact Disc - Read Only Memory
DOS........................Disk Operating System
DPW.......................Data Preparation Workbook
EDR........................Experiment Data Record
EOF........................End of File
HFS........................Hierarchical File System
ISO..........................International Standards Organization
JPL..........................Jet Propulsion Laboratory
Mbytes...................Megabytes
MIPL.......................Multimission Image Processing Laboratory
MIPS.......................Multimission Image Processing Subsystem
OPNAV...................Optical Navigation
PDS........................Planetary Data System
PSDD......................Planetary Science Data Dictionary
REDR......................Raw Experiment Data Record
SIS..........................Software Interface Specification
SSI..........................Solid State Imaging subsystem
SPIDS.....................Standards for Preparation and Interchange of Data Sets
TBD........................To Be Determined
UDR........................Unprocessed Data Record
VICAR....................Video Image Communication and Retrieval software
VMS........................Virtual Memory System
WORM....................Write-Once Read-Many optical disk(s)
XAR........................Extended Attribute Record

1. INTRODUCTION

1.1 Content Overview

This Software Interface Specification (SIS) describes the form and content of the Raw Experiment Data Record Compact Disc - Read Only Memory (REDR CD-ROM).

The REDR CD-ROMs shall be generated by the Galileo Project in order to distribute the images acquired by the Solid State Imaging (SSI) camera to the scientists and later to the Planetary Data System (PDS).

A detached PDS label shall be included for each image. Documentation files shall be provided which inform the user about the organization and contents of each disk, the definition of the labels and also an index file containing information about all the images stored in the dataset.

All PDS label formats and documentation are based on the Planetary Data System Data Preparation Workbook (see reference 4). The VICAR label's format and documentation can be referenced in the VICAR User's Guide (see reference 5).

All data formats are based on the Planetary Science Data Dictionary Document (PSDD) and the Planetary Data System document DPW (see references 1 and 4) and are similar to the formats used in generating the Voyager CD-ROM set (see reference 2).

Section 1 of this document contains general information. Section 2 describes characteristics of the physical media (CD) used in transmitting REDRs, and Section 3 specifies their logical (media-independent) contents.

1.2 Scope

The specifications in this document apply to all REDR CD-ROMs that are produced during the Galileo mission.

1.3 Applicable Documents

The italicized trailers to each document citation (following the dash) indicate the applicability of the document to this product and / or SIS.

[1] Planetary Science Data Dictionary Document,***D-7116, rev B .*** May 1, 1991. ---*Standard data product descriptions,*

[2] Voyagers to the Outer Planets, volumes 1-8 (on CD-ROMs), Planetary Data System, 1989.---*Data Format*

[3] ISO 9660-1988. April 1988---*CD-ROM format.*

[4] PDS Data Preparation Workbook (DPW). ***D-7669.*** May 1991.---*PDS label and table formats.*

[5] VICAR User's Guide, ***D- 4186, rev A***, June 1, 1989. ---*VICAR label formats.*

[6] SSI Experiment Data Record Software Interface Specification (EDR SIS). ***232-07,*** June 24, 1991---*Structure and content of EDRs.*

[7] SSI Raw Experiment Data Record Software Interface Specification (REDR SIS). ***232-15,*** May 7, 1992.---*Structure and content of REDRs.*

[8] SSI Unprocessed Data Record for Optical Navigation Software Interface Specification (UDR / OPNAV SIS). ***232-04,*** June 24, 1991.---*Structure and content of UDRs.*

[9] SSI Image Catalog (Cruise) Software Interface Specification, ***232-12***, June 24, 1991.---*Structure and content of UDRs.*

[10] Image Processing Subsystem Functional Requirements Document, ***GLL-4-232,*** March 10, 1992. --- *EDR production rates.*

2 INTERFACE CHARACTERISTICS

2.1 Operations Perspective

2.1.1 Data Source, Destinations, and Transfer Method

REDR CD-ROMs shall be produced by MIPS for distribution to the Galileo Project. MIPS shall use commercially available CD-ROM publishing software, which shall reside at MIPS, to produce premastered tapes for delivery and release to the mastering vendor for production of CD-ROMs. The mastering vendor will ship the discs to MIPS for distribution and archiving.

2.1.2 Generation Method and Frequency

The REDR CD-ROM data shall be generated by using a series of VICAR programs. The REDR data processing steps include: merging partial frames together, updating VICAR labels (optional), updating the Bad Data Value Label with bad data values (optional), applying blemish corrections to image data (optional), filling in missing data lines (optional), generating a PDS label and pre-mastering data to an 8mm tape.

The CD-ROMs shall be produced at the following rates: during cruise they shall be produced as rapidly as possible on a best efforts basis, during Jupiter Orbital Operations they shall be produced at the rate specified in the Image Processing Subsystem Functional Requirements Document [see reference 10].

2.2 Volume and Size

Each CD-ROM shall contain approximately 800 Galileo SSI images in the REDR format.

Each CD-ROM shall contain at most 650 Mbytes of data.

2.3 Interface Medium Characteristics

REDR CD-ROM physical characteristics shall conform to ISO-9660 industry standards [see reference 3].

2.4 Backup and Duplicate Copies

The CD-ROM contents shall be stored on magnetic disk until a validated master has been produced. REDR image data files, excluding the text and PDS labels, shall be retained on a CD write once at MIPS.

2.5 MIPS Label ID

Each REDR tape or CD-ROM to be sent to the vendor will bear a label id using the following format:

PROJECT_SEQUENCE;VERSION

PROJECT = GO_

SEQUENCE = CD followed by three digits.

VERSION = A single digit determining version number of the CD-ROM.

EXAMPLE = GO_CD003;1

3 CD-ROM CONTENT AND FORMAT

This section describes in detail the format and content of the REDR CD-ROM.

3.1 Format

REDR CD-ROM data shall be formatted in accordance with Planetary Data System specifications [see references 1, 4]. The format is described below.

3.1.1 Disk Format

The REDR CD-ROM format shall be compatible with various computer systems including IBM PC, Apple Macintosh, Sun, Digital VAX. The REDR CD-ROM format shall be in accordance with ISO 9660 level 1 Interchange Standard [see reference 3], with file attributes specified by Extended Attribute Records (XARs) (logical blocks of 512 bytes), to provide a file system of directories, sub-directories, and data files. Computer systems that do not support XARs will either ignore them or append them to the beginning of the file. In the latter case, the user must ignore the first 512 bytes of each file.

3.1.2 File Formats

The following paragraphs describe file formats for the various kinds of files contained on the CD-ROMs.

3.1.2.1 Image Files

Image files (.IMG suffix) exist only in the target directories. The files contain a VICAR label, Binary Telemetry Header, Bad Label Header, a Binary Prefix and the imaging data. See the REDR SIS (Reference 7) for additional information regarding the image file data structure.

3.1.2.2 Document Files

Document files (.TXT suffix) exist in the root and document directories. They are ASCII files with embedded PDS labels. All document files contain stream files with ASCII carriage return and line feed characters at the end of each line. This allows the files to be read by the HFS, DOS, Unix, and VMS operating systems.

3.1.2.3 Tabular Files

Tabular files (.TAB suffix) exist in the index directory. Tabular files are ASCII files formatted for direct reading into many database management systems on various computers. All fields are separated by commas, and character fields are enclosed in double quotation marks ("). (Character fields are padded with spaces to keep quotation marks in the same columns.) Character fields are left justified, and numeric fields are right justified. The "start byte" and "bytes" values listed in the labels do not include the commas between fields or the quotation marks surrounding character fields. The records are of fixed length, and the last two bytes of each record contain the ASCII carriage return and line feed characters. This allows a table to be treated as a fixed length record file on computers that support this file type and as a normal text file on other computers.

All tabular files are described by detached PDS labels. The PDS label file has the same name as the data file it describes, with the extension .LBL; for example, the file

IMGINDEX.TAB is accompanied by the detached label file IMGINDEX.LBL in the same directory.

3.1.2.4 PDS Label Files

PDS label files (.LBL suffix) are located in the target directories. They are descriptive labels [see reference 4 and paragraph 3.2.2] and are detached from their associated file. The PDS label file is an object-oriented file; the object to which the label refers (e.g. IMAGE, TABLE, etc.) is denoted by a statement of the form:

```
^object = location
```

in which the carat character (^, also called a pointer in this context) indicates that the object starts at the given location. The location denotes the name of the file containing the object, along with the starting record or byte number, if there is more than one object. For example:

```
^IMAGE_HEADER = ("7890R.IMG",1)
^IMAGE = ("7890R.IMG",3)
```

indicates that the IMAGE object begins at record 3 of the file 7890R.IMG, in the same directory as the detached label file. Below is a list of the possible formats for the ^object definition.

```
^object  = n
^object  = n<BYTES>
^object  = ("filename.ext")
^object  = ("filename.ext",n)
^object  = ("[dirlist]filename.ext",n)
^object  = ("filename.ext",n<BYTES>)
^object  = ("[dirlist]filename.ext",n<BYTES>)
```

where

n	is the starting record or byte number of the object, counting from the beginning of the file (record 1, byte 1),
<BYTES>	indicates that the number given is in units of bytes,
filename	is the upper-case file name,
ext	is the upper-case file extension,
dirlist	is a period-delimited path-list of parent directories, in upper case, that specifies the object file directory (used only when the object is not in the same directory as the label file). The list begins at directory level below the root directory of the CD-ROM. '[dirlist]' may be omitted when the object being described is located either in the same directory as the detached label, or in a subdirectory named 'label' that is located in a higher level of the directory tree, typically the CD-ROM root itself.

All detached labels contain 80-byte fixed-length records, with a carriage return character (ASCII 13) in the 79th byte and a line feed character (ASCII 10) in the 80th byte. This allows the files to be read by the HFS, DOS, Unix, and VMS operating systems.

3.1.2.5 PDS Format Files

Format files (RLINEPRX .FMT and RTLMTAB.FMT) exist in the label directory. These files are PDS labels that describe the structure of the binary line prefixes and file headers of REDRs (RLINEPRX.FMT, RTLMTAB.FMT). They are descriptive label files [see reference 4 and paragraph 3.2.2] and are detached from their associated file.

3.2 Content

The following paragraphs describe the content of the CD-ROMs.

3.2.1 Directories

The REDR CD-ROM directory structure consists of one root directory, an index subdirectory, a document subdirectory, a label subdirectory, and subdirectories by target or activity of the REDRs.

Files in the root directory provide label and text describing the content and format of the REDR CD-ROMs. Files in the index directory provide a table of label items describing the observation of a respective REDR frame, and a PDS label which in turn describes the index table. The index table entry is generated after each REDR file is processed in the CD generation procedure. The index table on each CD-ROM shall only reflect those files contained on that CD-ROM, except for the final CD-ROM of each of the dataset, which shall contain a complete listing of the entire index table.

Files in the label subdirectory are the same on all CD-ROMs and contain VICAR label and REDR binary header and line prefix information. Files in each of the target subdirectories consist of an REDR image file and an associated label file, organized in sub-directories by RIM count of the Spacecraft Clock (SCLK). The following tables describe the content and source of files in the REDR CD-ROM directories. (Source indicates group providing current version of file.)

3.2.1.1 Root Directory

The following table lists the files in the root directory.

File	Contents	Source
AAREADME.TXT	CD-ROM content and format information	MIPS
VOLDESC.SFD	A description of the contents of this CD-ROM volume in a human and machine readable format	MIPS

3.2.1.2 Index Directory

The following table lists the files in the index subdirectory.

File	Contents	Source
IMGINDEX.TAB	A tabular listing of selected label items of each REDR observation / image file to be used for database cross-reference and search applications by CD end-users.	MIPS
IMGINDEX.LBL	A PDS detached label that describes IMGINDEX.TAB	MIPS

3.2.1.3 Label Directory

The label directory contains REDR binary line prefix and file header structural information in .FMT files. The following table lists the files in the label directory.

File	Contents	Source
RTLMTAB.FMT	PDS label describing the structure of an REDR binary file header (telemetry header) in a column and bit-column fashion.	MIPS
RLINEPRX.FMT	PDS label describing the structure of an REDR binary line prefix in a column and bit-column fashion.	MIPS

3.2.1.4 Document Directory

This directory contains the REDR VICAR image header descriptive information, bad data values of image binary header and a description of the PDS label.

File	Contents	Source
BADDATA.TXT	Textual file describing the structure and organization of EDR and REDR bad data value headers.	MIPS
PDSLABEL.TXT	Textual file describing the structure and organization of EDR and REDR PDS label.	MIPS
VICAR2.TXT	Textual file describing the structure and organization of EDR and REDR image headers, known at MIPS as the VICAR labels.	MIPS
CATSTAT.TXT	Textual file describing the current MIPS catalog status.	MIPS
VOLINFO.TXT	Textual file describing the mission data-sets, how the datasets are created & used, calib. info & reference.	SSI

3.2.1.5 Target Directories

The target directories contain the actual image data. The image data has been sorted by target body, e.g. EARTH, MOON, VENUS, etc. and the directories named accordingly. Within each target directory, the observations have been grouped by common RIM count of the Spacecraft Clock (SCLK). These subdirectories are named `Crrrrrr`, where the r's represent the first six of eight digits of the RIM count in the SCLK, that has been padded with preceding zeros. (e.g. [Venus.C001806])

The REDR data and the matching detached PDS labels will be found within the RIM subdirectories, These files are named rrmmR.IMG, where rr is the remaining two digits of the RIM count, and mm is the MOD91 count in the SCLK. See the following table for examples and brief definitions of the REDR and PDS files.

File	Contents	Source

rrmmR.IMG (e.g. 5600R.IMG)	The byte, uncalibrated REDR image file of dimensions 800 lines by 800 samples and for the summation mode, 400 lines by 400 samples.	MIPS
rrmmR.LBL (e.g. 5600R.LBL)	A PDS detached label that describes rrmmR.IMG	MIPS

3.2.2 Files

The contents of the REDR CD-ROM files are described in the following paragraphs. Paragraphs 3.2.2.2, 3.2.2.3, 3.2.2.4 list PDS labels which describe files VOLDESC.SFD, image files and the index table. Format files (.FMT) describe the structure of the binary header and line prefix. The keywords on the left are static; the values on the right are variable, except for the .FMT files.

> *NOTE: The labels listed below are not literally reproduced. For the exact structure of PDS labels refer to DPW [see reference 4].*

3.2.2.1 Image Data Files

The Image Data Files are in the REDR format. See the above table for a brief definition of the format. See reference 7 for additional information.

3.2.2.2 VOLDESC.SFD Label

```
CCSD3ZF0000100000001NJPL3IF0PDS200000001    = SFDU_LABEL

OBJECT                          = VOLUME
 VOLUME_SET_NAME                = "Mission to Jupiter"
 VOLUME_SET_ID                  = USA_NASA_JPL_GO_0002
 VOLUMES                        = UNK
 VOLUME_NAME                    = "Galileo:Solid State Imaging REDR Data"
 VOLUME_ID                      = GO_0002
 VOLUME_VERSION_ID              = "VERSION 1"
 MEDIUM_TYPE                    = "CD-ROM"
 PUBLICATION_DATE               = 1992-4-10
 VOLUME_DESC                    = "Disc  of Galileo REDR images"
 MISSION_NAME                   = GALILEO
 MISSION_PHASE_NAME             = CRUISE
 SPACECRAFT_NAME                = "GALILEO ORBITER"
 SPACECRAFT_ID                  = GO
 FIRST_IMAGE_TIME               = 'N / A'
 LAST_IMAGE_TIME                = 1990-11-30T22:05:39.077Z
 FIRST_IMAGE_NUMBER             = 00030611.00
 LAST_IMAGE_NUMBER              = 00598912.00
 FIRST_IMAGE_ID                 = 'N / A'
 LAST_IMAGE_ID                  = E1N0900

OBJECT                          = DATA_PRODUCER
 PRODUCER_INSTITUTION_NAME      = "JET PROPULSION LABORATORY"
 PRODUCER_FACILITY_NAME         = "MULTI-MISSION IMAGE PROCESSING SUBSYSTEM"
 PRODUCER_FULL_NAME             = "LISA WAINIO"
```

```
 DISCIPLINE_NAME                      = "IMAGE PROCESSING"
 ADDRESS_TEXT                         = "JET PROPULSION LABORATORY /n
                                         4800 OAK GROVE DRIVE /n
                                         MAILSTOP 168-514 /n
                                         PASADENA, CA 91109 /n
                                         USA"
END_OBJECT

OBJECT                                = CATALOG
 ^CATALOG                             = NULL
END_OBJECT                            = CATALOG
END_OBJECT
END
```

3.2.2.3 PDS Image Label

```
CCSD3ZF0000100000001NJPL3IF0PDS200000001 = SFDU_LABEL

/* File Format and Length */
RECORD_TYPE                           = FIXED_LENGTH
RECORD_BYTES                   = 1000
FILE_RECORDS                          = 806

/* Pointers to Data Objects */
^IMAGE_HEADER                         = ("2700R.IMG",1)
^TELEMETRY_TABLE                      = ("2700R.IMG",3)
^BAD_DATA_VALUES_HEADER  = ("2700R.IMG",5)
^IMAGE                                = ("2700R.IMG",7)
^LINE_PREFIX_TABLE                    = ("2700R.IMG",7)

/* Description/Catalog Keywords */
DATA_SET_ID                           = "GO-A/E-SSI-2-REDR-V1.0"
SPACECRAFT_NAME                       = "GALILEO ORBITER"
INSTRUMENT_NAME                       = SOLID_STATE_IMAGING

/* Time tags and observation descriptors */
SPACECRAFT_CLOCK_START_COUNT          = "01650327.00"
IMAGE_TIME                            = 1992-12-08T04:22:18.228Z
IMAGE_ID                              = E2L0584
ORBIT_NUMBER                          = 12869
OBSERVATION_ID                        = "E2LNHIRES_01*000LCLR"
TARGET_NAME                    = "MOON"
TIME_FROM_CLOSEST_APPROACH            = -000T10:47:06Z
SATELLITE_TIME_FROM_CLST_APR          = 000T00:24:33Z
NOTE    = "NOT APPLICABLE"

/* Camera and spacecraft state parameters */
FILTER_NAME                           = "VIOLET"
FILTER_NUMBER                         = 3
EXPOSURE_DURATION                     =   66.67
GAIN_MODE_ID                          = "100K"
FRAME_DURATION                        =  30.333
LIGHT_FLOOD_STATE_FLAG                = "ON"
EXPOSURE_TYPE                         = "NORMAL"
BLEMISH_PROTECTION_FLAG               = "OFF"
INVERTED_CLOCK_STATE_FLAG             = "NOT INVERTED"
ENCODING_TYPE                         = "RATE CONTROL"
ENTROPY                               =   3.341
MEAN_TRUNCATED_BITS                   =   0.000
MEAN_TRUNCATED_SAMPLES                =   0.000
TELEMETRY_FORMAT_ID                   = "HCM"
OBSTRUCTION_ID                        = "NOT POSSIBLE"

/* Viewing Geometry */
/* Note: These viewing geometry parameters are best estimates */
```

```
/* at the time this picture label was generated. */
POSITIVE_LONGITUDE_DIRECTION         = WEST

/* Spacecraft position */
TARGET_CENTER_DISTANCE               = 1.127446e+05
CENTRAL_BODY_DISTANCE                = 3.607307e+05
SUB_SPACECRAFT_LATITUDE              =   56.585
SUB_SPACECRAFT_LONGITUDE =  320.180

/* Camera pointing direction */
TWIST_ANGLE                          =  207.481
CONE_ANGLE                           =  117.596
RIGHT_ASCENSION                      =   96.523
DECLINATION                          =  -33.157
SUB_SPACECRAFT_LINE                  = -854.170
SUB_SPACECRAFT_LINE_SAMPLE           =  161.442
NORTH_AZIMUTH                        =  330.481
SUB_SPACECRAFT_AZIMUTH               =  209.808
SMEAR_AZIMUTH                        =    0.000
SMEAR_MAGNITUDE                      = UNK
HORIZONTAL_PIXEL_SCALE               = 1.130000e+03
VERTICAL_PIXEL_SCALE                 = 1.367990e+03
SLANT_DISTANCE                       = 1.117950e+05
CENTER_LATITUDE                      =   17.752
CENTER_LONGITUDE                     =  264.712
CENTER_RING_RADIUS                   = 0.000000e+00

/* Lighting geometry */
SOLAR_DISTANCE                       = 1.477011e+08
SUB_SOLAR_LATITUDE              =   -0.138
SUB_SOLAR_LONGITUDE                  =  342.756
SUB_SOLAR_AZIMUTH                    =  175.418
INCIDENCE_ANGLE                      =   78.665
EMISSION_ANGLE                       =   57.252
PHASE_ANGLE                          =   59.488
LOCAL_HOUR_ANGLE                     = UNK

/* Target radii */
A_AXIS_RADIUS                        = 1.737400e+03
B_AXIS_RADIUS                        = 1.737400e+03
C_AXIS_RADIUS                        = 1.737400e+03

/* Processing parameters */
MEAN_RADIANCE                        = "N/A"
MEAN_REFLECTANCE                     = "N/A"
REFLECTANCE_SCALING_FACTOR           = "N/A"
RADIANCE_SCALING_FACTOR              = "N/A"
UNEVEN_BIT_WEIGHT_CORR_FLAG          = "N/A"
DARK_CURRENT_FILE_NAME               = "N/A"
SLOPE_FILE_NAME                      = "N/A"
BLEMISH_FILE_NAME                    = "N/A"
SHUTTER_OFFSET_FILE_NAME             = "N/A"
EDR_TAPE_ID                          = "N/A"
EDR_FILE_NUMBER                      = "N/A"
DATA_TYPE                            = LSB_UNSIGNED_INTEGER
SOURCE_PRODUCT_ID = {"GLL920818.BSP_1","GLL920818.BSP_1","N/A","CK_SSI_ACTUAL_
EE11.BC","SSI_MINI_E.EE11DD"}
PROCESSING_HISTORY_TEXT = "VICAR programs run: CATLABEL,BADLABEL,COPY."
PRODUCT_TYPE                         = "REDR"

/* VICAR IMAGE HEADER Object */
OBJECT                          = IMAGE_HEADER
INTERCHANGE_FORMAT                   = BINARY
TYPE                                 = VICAR2
BYTES                                = 2000
RECORDS                              = 2
^DESCRIPTION                         = "VICAR2.TXT"
```

```
END_OBJECT

/* Table Object (for telemetry table) */
OBJECT                        = TELEMETRY_TABLE
INTERCHANGE_FORMAT                 = BINARY
ROWS                               = 1
COLUMNS                            = 86
ROW_BYTES                          = 1800
^STRUCTURE                         = "RTLMTAB.FMT"
END_OBJECT

/* Bad Data Value Header Object */
OBJECT                        = BAD_DATA_VALUES_HEADER
TYPE                               = BDV
INTERCHANGE_FORMAT                 = BINARY
BYTES                              = 2000
RECORDS                            = 2
^DESCRIPTION                       = "BADDATA.TXT"
END_OBJECT

/* Image Object */
OBJECT                        = IMAGE
LINES                              = 800
LINE_SAMPLES                  = 800
SAMPLE_BITS                        = 8
SAMPLE_TYPE                        = UNSIGNED_INTEGER
INVALID                            = "N/A"
LINE_PREFIX_BYTES                  = 200
^LINE_PREFIX_STRUCTURE             = "RLINEPRX.FMT"
END_OBJECT
END
```

3.2.2.4 IMGINDEX Label

```
CCSD3ZF0000100000001NJPL3IF0PDS200000001        = SFDU_LABEL
RECORD_TYPE                        = FIXED_LENGTH
RECORD_BYTES                  = 680
FILE_RECORDS                       = 800
^IMAGE_INDEX_TABLE            = "IMGINDEX.TAB"

OBJECT                        = IMAGE_INDEX_TABLE
 INTERCHANGE_FORMAT           = ASCII
 ROWS                         = 800
 ROW_BYTES                    = 680
 COLUMNS                      = 52
 OBJECT                       = COLUMN
  NAME                        = SPACECRAFT_CLOCK_START_COUNT
  DATA_TYPE                        = CHARACTER
  START_BYTE                  = 2
  BYTES                       = 11
  FORMAT                      = A11
  DESCRIPTION                 = "The spacecraft clock at time of
    image acquisition. The SCLK is formatted as follows: RIM.MOD91 "
 END_OBJECT                   = COLUMN

 OBJECT                       = COLUMN
  NAME                        = MISSION_NAME
  DATA_TYPE                        = CHARACTER
  START_BYTE                  = 16
  BYTES                       = 7
  FORMAT                      = A7
  DESCRIPTION                 = "Spacecraft name associated with
    the image.  Valid name is GALILEO."
 END_OBJECT                   = COLUMN

 OBJECT                       = COLUMN
  NAME                        = INSTRUMENT_ID
```

```
 DATA_TYPE                        = CHARACTER
 START_BYTE               = 26
 BYTES                    = 3
 FORMAT                   = A3
 DESCRIPTION              = "ID of the Galileo Instrument
   which acquired the image data.  Valid name is SSI (Solid
   State Imaging subsystem)."
END_OBJECT                = COLUMN

OBJECT                    = COLUMN
 NAME                     = DATA_SET_ID
 DATA_TYPE                = CHARACTER
 START_BYTE               = 32
 BYTES                    = 28
 FORMAT                   = A28
 DESCRIPTION              = "Name that PDS has attached to
   this dataset. Valid id is GO-A/E-SSI-2-REDR-V1.0 where GO
   is Galileo Orbiter, A/E identifies the target of the dataset,
   SSI is the instrument which acquired the data, 2 is CODMAC
   level, REDR is the product that was created and V1.0 is the
   version of the data."
END_OBJECT                = COLUMN

OBJECT                    = COLUMN
 NAME                     = IMAGE_ID
 DATA_TYPE                        = CHARACTER
 START_BYTE               = 63
 BYTES                    = 7
 FORMAT                   = A7
 DESCRIPTION              = "Image id which takes the form
   of XXYZZZZ.  XX is the orbit (A1, A2 etc is approach; C1,
   C2 is cruise). Y is the target body (J=Jupiter, A=Amalthea,
   I=Io, E=Europa, G=Ganymede, C=Callisto, S=Minor Satellites,
   R=ring, H=star, L=Moon, W=Earth, V=Venus, U=Ida, P=Gaspra).
   ZZZZ is the picture count which is generated in the sequence
   generation process and which is incremented separately for
   each target body in each orbit."
END_OBJECT                = COLUMN

OBJECT                    = COLUMN
 NAME                     = OBSERVATION_ID
 DATA_TYPE                        = CHARACTER
 START_BYTE               = 73
 BYTES                    = 20
 FORMAT                   = A20
 DESCRIPTION              = "This is the Galileo activity id
   of each image which is in the form NNTIOOOOOOMM#SSSXXXX.  NN
   is the Orbit number. T is the scan platform target body
   initial (if applicable). I is the instrument. OOOOOO is the
   orbit planning guide objective mnemonic.  MM is the
   sequential OAPEL number for each value of NNTIOOOOOO. # is
   the multiple observation flag symbol (- or *). SSS is the PA
   set number.  XXXX is the MIPL Processing Code."
END_OBJECT                = COLUMN

OBJECT                    = COLUMN
 NAME                     = PRODUCT_TYPE
 DATA_TYPE                        = CHARACTER
 START_BYTE               = 96
 BYTES                    = 4
 FORMAT                   = A4
 DESCRIPTION              = "Type of product.  Valid REDR
   (Raw Experiment Data Record) or EDR (Experiment Data
   Record)."
END_OBJECT                = COLUMN

OBJECT                    = COLUMN
```

```
 NAME                  = TARGET_NAME
 DATA_TYPE                    = CHARACTER
 START_BYTE            = 103
 BYTES                 = 10
 FORMAT                = A10
 DESCRIPTION           = "Observational target of the
   image."
END_OBJECT             = COLUMN

OBJECT                 = COLUMN
 NAME                  = IMAGE_TIME
 DATA_TYPE                    = CHARACTER
 START_BYTE            = 116
 BYTES                 = 24
 FORMAT                = A24
 DESCRIPTION           = "Time at which image data was
   acquired, in the format YYYY-MM-DDTHH:MM:SS:MMMZ.  The time
   system is Universl Time (UTC). 'YYYY' is year,' MM' is month,
   'DD'is day of month, 'HH' is hour, 'MM' is minute, 'SS' is
   second, 'MMM' is millisecond."
END_OBJECT             = COLUMN

OBJECT                 = COLUMN
 NAME                  = FILTER_NAME
 DATA_TYPE                    = CHARACTER
 START_BYTE            = 143
 BYTES                 = 7
 FORMAT                = A7
 DESCRIPTION           = "Optical filter used for the
   image. Valid filters include: CLEAR, GREEN, RED, VIOLET,
   IR-7560, IR-9680, IR-7270, IR-8890."
END_OBJECT             = COLUMN

OBJECT                 = COLUMN
 NAME                  = FILTER_NUMBER
 DATA_TYPE                    = INTEGER
 START_BYTE            = 152
 BYTES                 = 5
 FORMAT                = I5
 DESCRIPTION           = "Optical filter number,
   containing the unique number associated with the optical
   filter for the image. Valid 0-7."
END_OBJECT             = COLUMN

OBJECT                 = COLUMN
 NAME                  = EXPOSURE_DURATION
 DATA_TYPE                    = REAL
 START_BYTE            = 158
 BYTES                 = 8
 FORMAT                = "F8.2"
 DESCRIPTION           = "Exposure duration for the
   image, in milliseconds."
END_OBJECT             = COLUMN

OBJECT                 = COLUMN
 NAME                  = GAIN_MODE_ID
 DATA_TYPE                    = CHARACTER
 START_BYTE            = 168
 BYTES                 = 4
 FORMAT                = A4
 DESCRIPTION           = "Gain mode of the camera.  Valid
   400K, 100K, 40K, 10K."
END_OBJECT             = COLUMN

OBJECT                 = COLUMN
 NAME                  = FRAME_DURATION
 DATA_TYPE                    = REAL
```

```
 START_BYTE                    = 174
 BYTES                         = 8
 FORMAT                        = "F8.3"
 DESCRIPTION                   = "Scan rate of the camera read
   out in seconds.  Valid 2.333, 8.667, 30.333 60.667"
END_OBJECT                     = COLUMN

OBJECT                         = COLUMN
 NAME                          = OBSTRUCTION_ID
 DATA_TYPE                             = CHARACTER
 START_BYTE                    = 184
 BYTES                         = 17
 FORMAT                        = A17
 DESCRIPTION                   = "Identifies if a boom or other
   type of obstruction were obscuring the view of the camera
   during the exposure.  Valid values include: POSSIBLE, NOT
   POSSIBLE, OR PRESENCE VERIFIED."
END_OBJECT                     = COLUMN

OBJECT                         = COLUMN
 NAME                          = ORBIT_NUMBER
 DATA_TYPE                             = INTEGER
 START_BYTE                            = 203
 BYTES                         = 5
 FORMAT                        = I5
 DESCRIPTION                   = "Identifies Jupiter Orbit
   number.  Not applicable (N/A) until Jupiter Orbital
   Operations. For this delivery, UNK has been placed in the
   label."
END_OBJECT                     = COLUMN

OBJECT                         = COLUMN
 NAME                          = TIME_FROM_CLOSEST_APPROACH
 DATA_TYPE                             = CHARACTER
 START_BYTE                    = 210
 BYTES                         = 14
 FORMAT                        = A14
 DESCRIPTION                   = "Time from closest approach to
   central body in the form -dddThh:mm:ssZ.  If the value is
   missing or is the default, then UNK is placed here."
END_OBJECT                     = COLUMN

OBJECT                         = COLUMN
 NAME                          = SATELLITE_TIME_FROM_CLST_APR
 DATA_TYPE                             = CHARACTER
 START_BYTE                    = 227
 BYTES                         = 14
 FORMAT                        = A14
 DESCRIPTION                   = "Time from closest approach to
   the nearest satellite in the form -dddThh:mm:ssZ.  If the
   value is missing or is the default, then UNK is placed here."

END_OBJECT                     = COLUMN

OBJECT                         = COLUMN
 NAME                          = PHASE_ANGLE
 DATA_TYPE                             = REAL
 START_BYTE                    = 243
 BYTES                         = 8
 FORMAT                        = "F8.3"
 DESCRIPTION                   = "Phase angle in degrees"
END_OBJECT                     = COLUMN

OBJECT                         = COLUMN
 NAME                          = EMISSION_ANGLE
 DATA_TYPE                             = REAL
 START_BYTE                    = 252
```

```
  BYTES                    = 8
  FORMAT                   = "F8.3"
  DESCRIPTION              = "Emission angle in degrees"
END_OBJECT                 = COLUMN

OBJECT                     = COLUMN
  NAME                     = INCIDENCE_ANGLE
  DATA_TYPE                        = REAL
  START_BYTE               = 261
  BYTES                    = 8
  FORMAT                   = "F8.3"
  DESCRIPTION              = "Incidence angle in degrees"
END_OBJECT                 = COLUMN

OBJECT                     = COLUMN
  NAME                     = LOCAL_HOUR_ANGLE
  DATA_TYPE                        = REAL
  START_BYTE               = 270
  BYTES                    = 8
  FORMAT                   = "F8.3"
  DESCRIPTION              = "Local hour angle in degrees"
END_OBJECT                 = COLUMN

OBJECT                     = COLUMN
  NAME                     = TWIST_ANGLE
  DATA_TYPE                = REAL
  START_BYTE               = 279
  BYTES                    = 8
  FORMAT                   = "F8.3"
  DESCRIPTION              = "Twist angle in degrees"
END_OBJECT                 = COLUMN

OBJECT                     = COLUMN
  NAME                     = CONE_ANGLE
  DATA_TYPE                = REAL
  START_BYTE               = 288
  BYTES                    = 8
  FORMAT                   = "F8.3"
  DESCRIPTION              = "Cone angle in degrees"
END_OBJECT                 = COLUMN

OBJECT                     = COLUMN
  NAME                     = RIGHT_ASCENSION
  DATA_TYPE                = REAL
  START_BYTE               = 297
  BYTES                    = 8
  FORMAT                   = "F8.3"
  DESCRIPTION              = "Right Ascension in degrees"
END_OBJECT                 = COLUMN

OBJECT                     = COLUMN
  NAME                     = DECLINATION
  DATA_TYPE                        = REAL
  START_BYTE               = 306
  BYTES                    = 8
  FORMAT                   = "F8.3"
  DESCRIPTION              = "Declination in degrees"
END_OBJECT                 = COLUMN

OBJECT                     = COLUMN
  NAME                     = NORTH_AZIMUTH
  DATA_TYPE                        = REAL
  START_BYTE               = 315
  BYTES                    = 8
  FORMAT                   = "F8.3"
  DESCRIPTION              = "North Azimuth in degrees"
END_OBJECT                 = COLUMN
```

```
OBJECT                          = COLUMN
 NAME                           = SMEAR_AZIMUTH
 DATA_TYPE                              = REAL
 START_BYTE                     = 324
 BYTES                          = 8
 FORMAT                         = "F8.3"
 DESCRIPTION                    = "Smear Azimuth in degrees"
END_OBJECT                      = COLUMN

OBJECT                          = COLUMN
 NAME                           = SMEAR_MAGNITUDE
 DATA_TYPE                      = REAL
 START_BYTE                     = 333
 BYTES                          = 8
 FORMAT                         = "F8.3"
 DESCRIPTION                    = "Smear magnitude in pixels."
END_OBJECT                      = COLUMN

OBJECT                          = COLUMN
 NAME                           = HORIZONTAL_PIXEL_SCALE
 DATA_TYPE                      = REAL
 START_BYTE                     = 342
 BYTES                          = 12
 FORMAT                         = "E12"
 DESCRIPTION                    = "Horizontal pixel scale in
    meters / pixel."
END_OBJECT                      = COLUMN

OBJECT                          = COLUMN
 NAME                           = VERTICAL_PIXEL_SCALE
 DATA_TYPE                              = REAL
 START_BYTE                     = 355
 BYTES                          = 12
 FORMAT                         = "E12"
 DESCRIPTION                    = "Vertical pixel scale in
    meters / pixel."
END_OBJECT                      = COLUMN

OBJECT                          = COLUMN
 NAME                           = SLANT_DISTANCE
 DATA_TYPE                              = REAL
 START_BYTE                     = 368
 BYTES                          = 12
 FORMAT                         = "E12"
 DESCRIPTION                    = "Spacecraft to target slant
    range in km."
END_OBJECT                      = COLUMN

OBJECT                          = COLUMN
 NAME                           = CENTER_LATITUDE
 DATA_TYPE                              = REAL
 START_BYTE                     = 381
 BYTES                          = 8
 FORMAT                         = "F8.3"
 DESCRIPTION                    = "Latitude of center of frame in
    degrees."
END_OBJECT                      = COLUMN

OBJECT                          = COLUMN
 NAME                           = CENTER_LONGITUDE
 DATA_TYPE                              = REAL
 START_BYTE                     = 390
 BYTES                          = 8
 FORMAT                         = "F8.3"
 DESCRIPTION                    = "Longitude of center of frame in
    degrees."
```

```
END_OBJECT                = COLUMN

OBJECT                    = COLUMN
 NAME                     = TARGET_CENTER_DISTANCE
 DATA_TYPE                        = REAL
 START_BYTE               = 399
 BYTES                    = 12
 FORMAT                   = "E12"
 DESCRIPTION              = "Range from spacecraft to target
   center in km."
END_OBJECT                = COLUMN

OBJECT                    = COLUMN
 NAME                     = CENTRAL_BODY_DISTANCE
 DATA_TYPE                        = REAL
 START_BYTE               = 412
 BYTES                    = 12
 FORMAT                   = "E12"
 DESCRIPTION              = "Distance from spacecraft to
   planet in km."
END_OBJECT                = COLUMN

OBJECT                    = COLUMN
 NAME                     = SUB_SPACECRAFT_LATITUDE
 DATA_TYPE                        = REAL
 START_BYTE               = 425
 BYTES                    = 8
 FORMAT                   = "F8.3"
 DESCRIPTION              = "Planetocentric sub-spacecraft
   latitude of spacecraft position vector in degrees."
END_OBJECT                = COLUMN

OBJECT                    = COLUMN
 NAME                     = SUB_SPACECRAFT_LONGITUDE
 DATA_TYPE                        = REAL
 START_BYTE               = 434
 BYTES                    = 8
 FORMAT                   = "F8.3"
 DESCRIPTION              = "West longitude of spacecraft
   position vector in degrees."
END_OBJECT                = COLUMN

OBJECT                    = COLUMN
 NAME                     = SUB_SOLAR_AZIMUTH
 DATA_TYPE                        = REAL
 START_BYTE               = 443
 BYTES                    = 8
 FORMAT                   = "F8.3"
 DESCRIPTION              = "Sub-solar azimuth in degrees."
END_OBJECT                = COLUMN

OBJECT                    = COLUMN
 NAME                     = SUB_SOLAR_LATITUDE
 DATA_TYPE                        = REAL
 START_BYTE               = 452
 BYTES                    = 8
 FORMAT                   = "F8.3"
 DESCRIPTION              = "Planetocentric sub-solar latitude
   in degrees."
END_OBJECT                = COLUMN

OBJECT                    = COLUMN
 NAME                     = SUB_SOLAR_LONGITUDE
 DATA_TYPE                        = REAL
 START_BYTE               = 461
 BYTES                    = 8
 FORMAT                   = "F8.3"
```

```
  DESCRIPTION                  = "Sub-solar west longitude in degrees"
END_OBJECT                     = COLUMN

OBJECT                         = COLUMN
  NAME                         = SOLAR_DISTANCE
  DATA_TYPE                             = REAL
  START_BYTE                   = 470
  BYTES                        = 12
  FORMAT                       = "E12"
  DESCRIPTION                  = "Distance from sun to target
     body in km."
END_OBJECT                     = COLUMN

OBJECT                         = COLUMN
  NAME                         = SUB_SPACECRAFT_LINE
  DATA_TYPE                             = INTEGER
  START_BYTE                   = 483
  BYTES                        = 8
  FORMAT                       = "F8.3"
  DESCRIPTION                  = "Line coordinate of sub-spacecraft
     point."
END_OBJECT                     = COLUMN

OBJECT                         = COLUMN
  NAME                         = SUB_SPACECRAFT_LINE_SAMPLE
  DATA_TYPE                             = INTEGER
  START_BYTE                   = 492
  BYTES                        = 8
  FORMAT                       = "F8.3"
  DESCRIPTION                  = "Sample coordinate of sub-spacecraft
     point."
END_OBJECT                     = COLUMN

OBJECT                         = COLUMN
  NAME                         = CENTER_RING_RADIUS
  DATA_TYPE                             = REAL
  START_BYTE                   = 501
  BYTES                        = 12
  FORMAT                       = "E12"
  DESCRIPTION                  = "Ring radius at center of frame
     in km. Not applicable until Jupiter Orbital Operations. For
     this delivery, a 0 has been placed in the label."
END_OBJECT                     = COLUMN

OBJECT                         = COLUMN
  NAME                         = MEAN_RADIANCE
  DATA_TYPE                    = REAL
  START_BYTE                   = 514
  BYTES                        = 8
  FORMAT                       = "F8.3"
  DESCRIPTION                  = " Not applicable for REDR
     data. For this delivery N/A has been placed in the label."
END_OBJECT                     = COLUMN

OBJECT                         = COLUMN
  NAME                         = MEAN_REFLECTANCE
  DATA_TYPE                             = REAL
  START_BYTE                   = 523
  BYTES                        = 8
  FORMAT                       = "F8.3"
  DESCRIPTION                  = "Not applicable for REDR
     data. For this delivery N/A has been placed in the label."
END_OBJECT                     = COLUMN

OBJECT                         = COLUMN
  NAME                         = RADIANCE_SCALING_FACTOR
  DATA_TYPE                             = REAL
```

```
  START_BYTE            = 532
  BYTES                 = 8
  FORMAT                = "F8.3"
  DESCRIPTION           = "Not applicable for REDR
    data. For this delivery N/A has been placed in the label. "
 END_OBJECT             = COLUMN

 OBJECT                 = COLUMN
  NAME                  = REFLECTANCE_SCALING_FACTOR
  DATA_TYPE             = REAL
  START_BYTE            = 541
  BYTES                 = 8
  FORMAT                = "F8.3"
  DESCRIPTION           = "Not applicable for REDR
    data. For this delivery N/A has been placed in the label."
 END_OBJECT             = COLUMN

 OBJECT                 = COLUMN
  NAME                  = VOLUME_ID
  DATA_TYPE                     = CHARACTER
  START_BYTE            = 551
  BYTES                 = 7
  FORMAT                = A7
  DESCRIPTION           = "CD-ROM volume on which the
    image file is recorded (e.g GO_0002)"
 END_OBJECT             = COLUMN

 OBJECT                 = COLUMN
  NAME                  = FILE_SPECIFICATION_NAME
  DATA_TYPE             = CHARACTER
  START_BYTE            = 561
  BYTES                 = 33
  FORMAT                = A33
  DESCRIPTION           = "File name for image file on
    CD-ROM.  Recorded in VAX directory format, with brackets
    indicating the directory hierarchy."
 END_OBJECT             = COLUMN

 OBJECT                 = COLUMN
  NAME                  = PROCESSING_HISTORY_TEXT
  DATA_TYPE             = CHARACTER
  START_BYTE            = 597
  BYTES                 = 80
  FORMAT                = A80
  DESCRIPTION           = "Processing history text.  List of
    all program names used to process image"
 END_OBJECT             = COLUMN

END_OBJECT              = IMAGE_INDEX_TABLE

END
```

3.2.2.5 Format Files

3.2.2.5.1 RTLMTAB.FMT

This file describes the structure of the REDR binary telemetry header that follows the VICAR label and precedes the bad data value header and the image.

```
OBJECT = COLUMN
NAME = RECORD_ID
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 1
BYTES = 1
DESCRIPTION = "Is always 0 for the telemetry record"
END_OBJECT

OBJECT = COLUMN
NAME = FILE_NUMBER
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 2
BYTES = 1
DESCRIPTION = "Tape file number. Not applicable for CD-ROMs."
END_OBJECT

OBJECT = COLUMN
NAME = MISSION_NAME
DATA_TYPE = CHARACTER
START_BYTE = 3
BYTES = 10
DESCRIPTION = "Mission name, valid is GALILEO."
END_OBJECT

OBJECT = COLUMN
NAME = INSTRUMENT_ID
DATA_TYPE = CHARACTER
START_BYTE = 13
BYTES = 6
DESCRIPTION = "Instrument identification, valid is SSI."
END_OBJECT

OBJECT = COLUMN
NAME = PHYSICAL_SEQUENCE
DATA_TYPE = LSB_UNSIGNED_INTEGER
START_BYTE = 19
BYTES = 2
DESCRIPTION = "Tape physical sequence record counter. Not valid for CD-ROMs."
END_OBJECT

OBJECT = COLUMN
NAME = LOGICAL_SEQUENCE
DATA_TYPE = LSB_UNSIGNED_INTEGER
START_BYTE = 21
BYTES = 2
DESCRIPTION = "Logical sequence record counter. Always 0 for the telemetry
  record"
END_OBJECT

OBJECT = COLUMN
NAME = FIRST_EARTH_RECEIVED_TIME_YEAR
DATA_TYPE = LSB_UNSIGNED_INTEGER
START_BYTE = 23
BYTES = 2
DESCRIPTION = "Earth received time year of the first record containing
  valid data."
END_OBJECT
```

```
OBJECT = COLUMN
NAME = FIRST_EARTH_RECEIVED_TIME_DAY
DATA_TYPE = LSB_UNSIGNED_INTEGER
START_BYTE = 25
BYTES = 2
DESCRIPTION = "Earth received time day of the first record containing
   valid data."
END_OBJECT

OBJECT = COLUMN
NAME = FIRST_EARTH_RECEIVED_TIME_HOUR
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 27
BYTES = 1
DESCRIPTION = "Earth received time hour of the first record containing
   valid data."
END_OBJECT

OBJECT = COLUMN
NAME = FIRST_EARTH_RECEIVED_TIME_MIN
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 28
BYTES = 1
DESCRIPTION = "Earth received time minute of the first record containing
   valid data."
END_OBJECT

OBJECT = COLUMN
NAME = FIRST_EARTH_RECEIVED_TIME_SEC
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 29
BYTES = 1
DESCRIPTION = "Earth received time second of the first record containing
   valid data."
END_OBJECT

OBJECT = COLUMN
NAME = FIRST_EARTH_RECEIVED_TIME_MSEC
DATA_TYPE = LSB_UNSIGNED_INTEGER
START_BYTE = 30
BYTES = 2
DESCRIPTION = "Earth received time millisecond of the first record containing
   valid data."
END_OBJECT

OBJECT = COLUMN
NAME = LAST_EARTH_RECEIVED_TIME_YEAR
DATA_TYPE = LSB_UNSIGNED_INTEGER
START_BYTE = 32
BYTES = 2
DESCRIPTION = "Earth received time year of the last record containing valid
   data."
END_OBJECT

OBJECT = COLUMN
NAME = LAST_EARTH_RECEIVED_TIME_DAY
DATA_TYPE = LSB_UNSIGNED_INTEGER
START_BYTE = 34
BYTES = 2
DESCRIPTION = "Earth received time day of the last record containing valid
   data."
END_OBJECT

OBJECT = COLUMN
NAME = LAST_EARTH_RECEIVED_TIME_HOUR
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 36
```

```
BYTES = 1
DESCRIPTION = "Earth received time hour of the last record containing valid
   data."
END_OBJECT

OBJECT = COLUMN
NAME = LAST_EARTH_RECEIVED_TIME_MIN
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 37
BYTES = 1
DESCRIPTION = "Earth received time minute of the last record containing
   valid data."
END_OBJECT

OBJECT = COLUMN
NAME = LAST_EARTH_RECEIVED_TIME_SEC
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 38
BYTES = 1
DESCRIPTION = "Earth received time second of the last record containing valid
   data."
END_OBJECT

OBJECT = COLUMN
NAME = LAST_EARTH_RECEIVED_TIME_MSEC
DATA_TYPE = LSB_UNSIGNED_INTEGER
START_BYTE = 39
BYTES = 2
DESCRIPTION = "Earth received time millisecond of the last record containing
   valid data."
END_OBJECT

OBJECT = COLUMN
NAME = FIRST_SPACECRAFT_CLK_CNT_RIM
DATA_TYPE = LSB_UNSIGNED_INTEGER
START_BYTE = 41
BYTES = 4
DESCRIPTION = "Spacecraft clock RIM of the first record in the file
   containing valid data."
END_OBJECT

OBJECT = COLUMN
NAME = FIRST_SPACECRAFT_CLK_CNT_MOD91
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 45
BYTES = 1
DESCRIPTION = "Spacecraft clock MOD91 of the first record in the file
   containing valid data."
END_OBJECT

OBJECT = COLUMN
NAME = FIRST_SPACECRAFT_CLK_CNT_MOD10
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 46
BYTES = 1
DESCRIPTION = "Spacecraft clock MOD10 of the first record in the file
   containing valid data."
END_OBJECT

OBJECT = COLUMN
NAME = FIRST_SPACECRAFT_CLK_CNT_MOD8
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 47
BYTES = 1
DESCRIPTION = "Spacecraft clock MOD8 of the first record in the file
   containing valid data."
END_OBJECT
```

```
OBJECT = COLUMN
NAME = LAST_SPACECRAFT_CLK_CNT_RIM
DATA_TYPE = LSB_UNSIGNED_INTEGER
START_BYTE = 48
BYTES = 4
DESCRIPTION = "Spacecraft clock RIM of the last record in the file
   containing valid data."
END_OBJECT

OBJECT = COLUMN
NAME = LAST_SPACECRAFT_CLK_CNT_MOD91
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 52
BYTES = 1
DESCRIPTION = "Spacecraft clock MOD91 of the last record in the file
   containing valid data."
END_OBJECT

OBJECT = COLUMN
NAME = LAST_SPACECRAFT_CLK_CNT_MOD10
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 53
BYTES = 1
DESCRIPTION = "Spacecraft clock MOD10 of the last record in the file
   containing valid data."
END_OBJECT

OBJECT = COLUMN
NAME = LAST_SPACECRAFT_CLK_CNT_MOD8
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 54
BYTES = 1
DESCRIPTION = "Spacecraft clock MOD8 of the last record in the file
   containing valid data."
END_OBJECT

OBJECT = COLUMN
NAME = SPACECRAFT_EVENT_TIME_YEAR
DATA_TYPE = LSB_UNSIGNED_INTEGER
START_BYTE = 55
BYTES = 2
DESCRIPTION = "Spacecraft Event Time year at the middle of the shutter-open
   period."
END_OBJECT

OBJECT = COLUMN
NAME = SPACECRAFT_EVENT_TIME_DAY
DATA_TYPE = LSB_UNSIGNED_INTEGER
START_BYTE = 57
BYTES = 2
DESCRIPTION = "Spacecraft Event Time day at the middle of the shutter-open
   period."
END_OBJECT

OBJECT = COLUMN
NAME = SPACECRAFT_EVENT_TIME_HOUR
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 59
BYTES = 1
DESCRIPTION = "Spacecraft Event Time hour at the middle of the shutter-open
   period."
END_OBJECT

OBJECT = COLUMN
NAME = SPACECRAFT_EVENT_TIME_MIN
DATA_TYPE = UNSIGNED_INTEGER
```

```
START_BYTE = 60
BYTES = 1
DESCRIPTION = "Spacecraft Event Time minute at the middle of the shutter-open
   period."
END_OBJECT

OBJECT = COLUMN
NAME = SPACECRAFT_EVENT_TIME_SEC
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 61
BYTES = 1
DESCRIPTION = "Spacecraft Event Time second at the middle of the shutter-open
   period."
END_OBJECT

OBJECT = COLUMN
NAME = SPACECRAFT_EVENT_TIME_MSEC
DATA_TYPE = LSB_UNSIGNED_INTEGER
START_BYTE = 62
BYTES = 2
DESCRIPTION = "Spacecraft Event Time millisecond at the middle of the
   shutter-open period."
END_OBJECT

OBJECT = COLUMN
NAME = OPERATING_SYSTEM_VERSION
DATA_TYPE = CHARACTER
START_BYTE = 64
BYTES = 8
DESCRIPTION = "MIPS operating system version number in the form of Vxxx.yyy.
   Currently not implemented."
END_OBJECT

OBJECT = COLUMN
NAME = GENERATING_DEVICE_TYPE
DATA_TYPE = CHARACTER
START_BYTE = 72
BYTES = 6
DESCRIPTION = "MIPS generating device type; e.g. _MTA0:.
   Currently not implemented."
END_OBJECT

OBJECT = COLUMN
NAME = GENERATING_DEVICE_ID
DATA_TYPE = CHARACTER
START_BYTE = 78
BYTES = 2
DESCRIPTION = "MIPS generating device id; e.g. A0, A1, etc.
   Currently not implemented."
END_OBJECT

OBJECT = COLUMN
NAME = GENERATING_DEVICE_VOLUME
DATA_TYPE = CHARACTER
START_BYTE = 80
BYTES = 8
DESCRIPTION = "MIPS generating device tape volume label.
   Currently not implemented."
END_OBJECT

OBJECT = COLUMN
NAME = RESERVED
DATA_TYPE = CHARACTER
START_BYTE = 88
BYTES = 8
DESCRIPTION = "MIPS physical recording words reserved space.
   Currently not implemented."
```

```
END_OBJECT

OBJECT = COLUMN
NAME = VALIDATION_ID
DATA_TYPE = CHARACTER
START_BYTE = 96
BYTES = 2
DESCRIPTION = "MIPS validation id; e.g. A0, A1, etc.
   Currently not implemented."
END_OBJECT

OBJECT = COLUMN
NAME = COMPUTER_PROCESSING_UNIT
DATA_TYPE = CHARACTER
START_BYTE = 98
BYTES = 8
DESCRIPTION = "MIPS cpu name; e.g. MIPL1.
   Currently not implemented."
END_OBJECT

OBJECT = COLUMN
NAME = GENERATION_DATE
DATA_TYPE = CHARACTER
START_BYTE = 106
BYTES = 11
DESCRIPTION = "MIPS generation date in the form DD-MMM-YYYY.
   Currently not implemented."
END_OBJECT

OBJECT = COLUMN
NAME = MIPS_PRD_RESERVED
DATA_TYPE = CHARACTER
START_BYTE = 117
BYTES = 6
DESCRIPTION = "MIPS physical recording reserved words.
   Currently not implemented."
END_OBJECT

OBJECT = COLUMN
NAME = FORMAT_ID
DATA_TYPE = LSB_UNSIGNED_INTEGER
START_BYTE = 123
BYTES = 2
DESCRIPTION = "The correct format ID for this image as derived from line
   records by a voting algorithm."
END_OBJECT

OBJECT = COLUMN
NAME = SYNC_CODE_ERRORS
DATA_TYPE = LSB_UNSIGNED_INTEGER
START_BYTE = 125
BYTES = 4
DESCRIPTION = "The sum of all bad bits in the sync code contained in all
   the line records in the file which contain valid data."
END_OBJECT

OBJECT = COLUMN
NAME = BOOM_OBSCURATION_FLAG
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 129
BYTES = 1
DESCRIPTION = "Boom obscuration flag. 0:Boom present; 1:Boom may be present;
   2:Boom not present."
END_OBJECT

OBJECT = COLUMN
NAME = MISSING_LINES
```

```
DATA_TYPE = LSB_UNSIGNED_INTEGER
START_BYTE = 130
BYTES = 2
DESCRIPTION = "Number of line records in the file with no valid pixels in
   the raw version of the image."
END_OBJECT

OBJECT = COLUMN
NAME = PARTIAL_LINES
DATA_TYPE = LSB_UNSIGNED_INTEGER
START_BYTE = 132
BYTES = 2
DESCRIPTION = "Total number of line records in the file which contain some
   valid pixels."
END_OBJECT

OBJECT = COLUMN
NAME = UNREADABLE_LINES
DATA_TYPE = LSB_UNSIGNED_INTEGER
START_BYTE = 134
BYTES = 2
DESCRIPTION = "Total number of records from the IDR and/or SDR which were
   unreadable and which fell within a time period for which data was
   required for this file."
END_OBJECT

OBJECT = COLUMN
NAME = SEQUENCE_BREAKS
DATA_TYPE = LSB_UNSIGNED_INTEGER
START_BYTE = 136
BYTES = 2
DESCRIPTION = "Total number of IDR/SDR gaps (indicated by a discontinuity
   in the logical record numbers) which occurred during the time data was
   required for this file."
END_OBJECT

OBJECT = COLUMN
NAME = SOURCE_INPUT
DATA_TYPE = LSB_UNSIGNED_INTEGER
START_BYTE = 138
BYTES = 2
DESCRIPTION = "Logical sum of all source/input line records with valid data."
END_OBJECT

OBJECT = COLUMN
NAME = WIDE_BAND_DATA_LINK_FRAMES
DATA_TYPE = LSB_UNSIGNED_INTEGER
START_BYTE = 140
BYTES = 2
DESCRIPTION = "Total number of minor frames in this file which were derived
   from WBDL input."
END_OBJECT

OBJECT = COLUMN
NAME = SYSTEM_DATA_RECORD_FRAMES
DATA_TYPE = LSB_UNSIGNED_INTEGER
START_BYTE = 142
BYTES = 2
DESCRIPTION = "Total number of minor frames in this file which were derived
   from SDR input."
END_OBJECT

OBJECT = COLUMN
NAME = STANDARD_FRMTD_DTA_UNT_FRMS
DATA_TYPE = LSB_UNSIGNED_INTEGER
START_BYTE = 144
BYTES = 2
```

```
DESCRIPTION = "Total number of minor frames in this file which were derived
   from SFDU input."
END_OBJECT

OBJECT = COLUMN
NAME = PICTURE_NUMBER
DATA_TYPE = CHARACTER
START_BYTE = 146
BYTES = 7
DESCRIPTION = "Picture number of the form XXYZZZZ where XX is the orbit,
   (A1, A2 etc. is approach; C1, C2 is cruise).  Y is the target body
   id (J=Jupiter, A=Amalthea, I=Io, E=Europa, G=Ganymede, C=Callisto,
   S=Minor Satellites, R=ring, H=star, L=Moon, W=Earth, V=Venus, U=Ida,
   P=Gaspra) and ZZZZ is the picture count which is generated in the
   sequence generation process and which is incremented separately for
   each target body in each orbit."
END_OBJECT

OBJECT = COLUMN
NAME = SSI_LOW_RATE_SCIENCE_PACKET
DATA_TYPE = LSB_UNSIGNED_INTEGER
START_BYTE = 153
BYTES = 1
ITEMS = 12
DESCRIPTION = "First SSI low rate science packet during this image."
END_OBJECT

OBJECT = COLUMN
NAME = FLAGS
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 165
BYTES = 2

 OBJECT = BIT_COLUMN
 NAME = COMPRESSED_IMAGING_FORMAT_FLAG
 BIT_DATA_TYPE = UNSIGNED_INTEGER
 START_BIT = 1
 BITS = 1
 DESCRIPTION = "Indicator of a compressed imaging format: 0 - Not
    compressed; 1 = Compressed."
 END_OBJECT

 OBJECT = BIT_COLUMN
 NAME = COMPRESSION_MODE_FLAG
 BIT_DATA_TYPE = UNSIGNED_INTEGER
 START_BIT = 2
 BITS = 1
 DESCRIPTION = "Compression mode: 0 - rate control; 1 - information
    preserving"
 END_OBJECT

 OBJECT = BIT_COLUMN
 NAME = EXPOSURE_MODE_FLAG
 BIT_DATA_TYPE = UNSIGNED_INTEGER
 START_BIT = 3
 BITS = 1
 DESCRIPTION = "Exposure modes: 0 - normal; 1 - extended exposure."
 END_OBJECT

 OBJECT = BIT_COLUMN
 NAME = LIGHT_FLOOD_FLAG
 BIT_DATA_TYPE = UNSIGNED_INTEGER
 START_BIT = 4
 BITS = 1
 DESCRIPTION = "Light flood status: 0 - off; 1 - on."
 END_OBJECT
```

```
 OBJECT = BIT_COLUMN
 NAME = BLEMISH_PROTECTION_FLAG
 BIT_DATA_TYPE = UNSIGNED_INTEGER
 START_BIT = 5
 BITS = 1
 DESCRIPTION = "Blemish protection: 0 - off; 1 - on."
 END_OBJECT

 OBJECT = BIT_COLUMN
 NAME = PARALLEL_CLOCK_FLAG
 BIT_DATA_TYPE = UNSIGNED_INTEGER
 START_BIT = 6
 BITS = 1
 DESCRIPTION = "Parallel clock state: 0 - normal; 1 - inverted."
 END_OBJECT

 OBJECT = BIT_COLUMN
 NAME = RESERVED
 BIT_DATA_TYPE = UNSIGNED_INTEGER
 START_BIT = 7
 BITS = 1
 ITEMS = 10
 DESCRIPTION = "Ten bits to fill VAX short"
 END_OBJECT

END_OBJECT

OBJECT = COLUMN
NAME = MEAN_DATA_NUMBER
DATA_TYPE = CHARACTER
START_BYTE = 167
BYTES = 6
DESCRIPTION = "Mean DN level of all valid pixels.  A real number represented
    as an ASCII string in the form 123.45."
END_OBJECT

OBJECT = COLUMN
NAME = TRUNCATED_BITS_PER_PIXEL
DATA_TYPE = CHARACTER
START_BYTE = 173
BYTES = 6
DESCRIPTION = "Mean number of truncated bits/pixel during data compression.
    Real number represented as an ASCII string in the form 12.345."
END_OBJECT

OBJECT = COLUMN
NAME = TRUNCATED_PIXELS_PER_LINE
DATA_TYPE = CHARACTER
START_BYTE = 179
BYTES = 6
DESCRIPTION = "Mean number of truncated pixels/line during data compression.
    A real number represented as an ASCII string in the form 12.345."
END_OBJECT

OBJECT = COLUMN
NAME = FILLER
DATA_TYPE = CHARACTER
START_BYTE = 185
BYTES = 12
DESCRIPTION = "Filler."
END_OBJECT

OBJECT = COLUMN
NAME = ENTROPY
DATA_TYPE = CHARACTER
START_BYTE = 197
BYTES = 7
```

DESCRIPTION = "Entropy level for the whole picture (bits / pixel). Real number
represented as an ASCII string in the form 12.3456."
END_OBJECT

OBJECT = COLUMN
NAME = ENTROPIES
DATA_TYPE = CHARACTER
START_BYTE = 204
BYTES = 7
ITEMS = 15
DESCRIPTION = "Entropy level for 15 lines. First line is 50 and incremented
by 50 to line 750. 15 real numbers represented as ASCII strings in the
form 12.3456."
END_OBJECT

OBJECT = COLUMN
NAME = RIGHT_ASCENSION
DATA_TYPE = CHARACTER
START_BYTE = 309
BYTES = 8
DESCRIPTION = "Scan platform coordinate at direction middle of shutter-open
period in J2000. Right ascension. A real number represented as an
ASCII string in the form 1234.567."
END_OBJECT

OBJECT = COLUMN
NAME = DECLINATION
DATA_TYPE = CHARACTER
START_BYTE = 317
BYTES = 8
DESCRIPTION = "Scan platform coordinate at direction middle of shutter-open
period in J2000. Declination. A real number represented as an ASCII
string in the form 1234.567. "
END_OBJECT

OBJECT = COLUMN
NAME = TWIST_ANGLE
DATA_TYPE = CHARACTER
START_BYTE = 325
BYTES = 8
DESCRIPTION = "Scan platform coordinate at direction middle of shutter-open
period in J2000. Twist angle. A real number represented as an ASCII
string in the form 1234.567."
END_OBJECT

OBJECT = COLUMN
NAME = FILLER
DATA_TYPE = CHARACTER
START_BYTE = 333
BYTES = 16
DESCRIPTION = "Filler."
END_OBJECT

OBJECT = COLUMN
NAME = FILLER
DATA_TYPE = CHARACTER
START_BYTE = 349
BYTES = 32
DESCRIPTION = "Filler."
END_OBJECT

OBJECT = COLUMN
NAME = FILLER
DATA_TYPE = CHARACTER
START_BYTE = 381
BYTES = 32
DESCRIPTION = "Filler."

```
END_OBJECT

OBJECT = COLUMN
NAME = ACTIVITY_ID
DATA_TYPE = CHARACTER
START_BYTE = 413
BYTES = 20
DESCRIPTION = "Activity id in the form NNTIOOOOOOMM#SSSXXXX where NN is
   the orbit number, T is the target body initial, I is the instrument,
   OOOOOO is the orbit planning guide objective mnemonic, MM is the
   sequential OAPEL number, # is multiple observation flag symbol
   (- or *), SSS is the PA set number and XXXX is the MIPL processing
   code."
END_OBJECT

OBJECT = COLUMN
NAME = FILLER
DATA_TYPE = INTEGER
START_BYTE = 433
BYTES = 1
DESCRIPTION = "Filler."
END_OBJECT

OBJECT = COLUMN
NAME = FILTER_NUMBER
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 434
BYTES = 1
DESCRIPTION = "Filter number: 0 - clear; 1 - green; 2 - red;
   3 - violet; 4 - IR7560; 5 - IR9680; 6 - IR7270; 7 - IR8890."
END_OBJECT

OBJECT = COLUMN
NAME = EXPOSURE_NUMBER
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 435
BYTES = 1
DESCRIPTION = "Exposure number which corresponds to an exposure time."
END_OBJECT

OBJECT = COLUMN
NAME = IMAGING_MODE
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 436
BYTES = 1
DESCRIPTION = "Imaging mode. 0:60-2/3 sec.; 1:8-2/3 sec.; 2:30-1/3 sec.;
   3:2-1/3 sec."
END_OBJECT

OBJECT = COLUMN
NAME = GAIN_MODE_ID
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 437
BYTES = 1
DESCRIPTION = "Gain mode. 0:Gain 1 - 400K; 1:Gain 2 - 100K; 2:Gain 3 - 40K;
   3:Gain 4 - 10K."
END_OBJECT

OBJECT = COLUMN
NAME = SOLAR_DISTANCE
DATA_TYPE = LSB_UNSIGNED_INTEGER
START_BYTE = 438
BYTES = 4
DESCRIPTION = "Target's range to sun in kilometers."
END_OBJECT

OBJECT = COLUMN
```

```
NAME = TELEMETRY_FORMAT_ID
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 442
BYTES = 1
DESCRIPTION = "Telemetry format number."
END_OBJECT

OBJECT = COLUMN
NAME = CATALOG_VERSION
DATA_TYPE = LSB_INTEGER
START_BYTE = 443
BYTES = 2
DESCRIPTION = "MIPS catalog image version number.  Reserved for MIPS"
END_OBJECT

OBJECT = COLUMN
NAME = STARTING_SC_CLK_CNT_RIM
DATA_TYPE = LSB_UNSIGNED_INTEGER
START_BYTE = 445
BYTES = 4
DESCRIPTION = "Spacecraft clock RIM of the start of image which refers
   to the start of the SSI frame cycle. May not be available."
END_OBJECT

OBJECT = COLUMN
NAME = STARTING_SC_CLK_CNT_MOD91
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 449
BYTES = 1
DESCRIPTION = "Spacecraft clock MOD91 of the start of image which refers
   to the start of the SSI frame cycle. May not be available."
END_OBJECT

OBJECT = COLUMN
NAME = STARTING_SC_CLK_CNT_MOD10
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 450
BYTES = 1
DESCRIPTION = "Spacecraft clock MOD10 of the start of image which refers
   to the start of the SSI frame cycle. May not be available."
END_OBJECT

OBJECT = COLUMN
NAME = STARTING_SC_CLK_CNT_MOD8
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 451
BYTES = 1
DESCRIPTION = "Spacecraft clock MOD8 of the start of image which refers
   to the start of the SSI frame cycle. May not be available."
END_OBJECT

OBJECT = COLUMN
NAME = ENDING_SC_CLK_CNT_RIM
DATA_TYPE = LSB_UNSIGNED_INTEGER
START_BYTE = 452
BYTES = 4
DESCRIPTION = "Spacecraft clock RIM at the end of image which refers
   to the end of the SSI frame cycle. May not be available."
END_OBJECT

OBJECT = COLUMN
NAME = ENDING_SC_CLK_CNT_MOD91
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 456
BYTES = 1
DESCRIPTION = "Spacecraft clock MOD91 of the end of image which refers
   to the end of the SSI frame cycle. May not be available."
```

```
END_OBJECT

OBJECT = COLUMN
NAME = ENDING_SC_CLK_CNT_MOD10
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 457
BYTES = 1
DESCRIPTION = "Spacecraft clock MOD10 of the end of image which refers
   to the end of the SSI frame cycle. May not be available."
END_OBJECT

OBJECT = COLUMN
NAME = ENDING_SC_CLK_CNT_MOD8
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 458
BYTES = 1
DESCRIPTION = "Spacecraft clock MOD8 of the end of image which refers
   to the end of the SSI frame cycle. May not be available."
END_OBJECT

OBJECT = COLUMN
NAME = RESERVED
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 459
BYTES = 1
ITEMS = 318
DESCRIPTION = "Reserved words"
END_OBJECT

OBJECT = COLUMN
NAME = HISTOGRAM
DATA_TYPE = LSB_UNSIGNED_INTEGER
START_BYTE = 777
BYTES = 4
ITEMS = 256
DESCRIPTION = "256 32-bit binary valued histogram of the pixels for this
   file, including fill data."
END_OBJECT
```

3.2.2.5.2 RLINEPRX.FMT

This file describes the structure of the REDR binary line prefix that precedes each image line.

```
OBJECT = LINE_PREFIX_TABLE
INTERCHANGE_FORMAT = BINARY
ROWS            = 800
COLUMNS         = 31
ROW_BYTES       = 200
ROW_SUFFIX_BYTES   = 800

OBJECT = COLUMN
NAME = RECORD_ID
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 1
BYTES = 1
DESCRIPTION = "Record id for line records. Always = 2."
END_OBJECT

OBJECT = COLUMN
NAME = FILE_NUMBER
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 2
BYTES = 1
DESCRIPTION = "Tape file number.  Always 0 if on disk."
END_OBJECT

OBJECT = COLUMN
NAME = PHYSICAL_SEQUENCE
DATA_TYPE = LSB_UNSIGNED_INTEGER
START_BYTE = 3
BYTES = 2
DESCRIPTION = "Tape physical sequence counter.  Not valid for CD-ROMS."
END_OBJECT

OBJECT = COLUMN
NAME = LOGICAL_SEQUENCE
DATA_TYPE = LSB_UNSIGNED_INTEGER
START_BYTE = 5
BYTES = 2
DESCRIPTION = "Logical sequence counter.  The telemetry header is zero and
   each line record is incremented by one.  This also corresponds to the
   image line number (1...800)."
END_OBJECT

OBJECT = COLUMN
NAME = EARTH_RECEIVED_TIME_YEAR
DATA_TYPE = LSB_UNSIGNED_INTEGER
START_BYTE = 7
BYTES = 2
DESCRIPTION = "Earth received time year of the first bit of the telemetry
   frame which contained the first pixel of this line as interpolated from
   the ERT in the GCF block containing this bit.  (The first bit of the
   frame is the first bit of the sync code.)"
END_OBJECT

OBJECT = COLUMN
NAME = EARTH_RECEIVED_TIME_DAY
DATA_TYPE = LSB_UNSIGNED_INTEGER
START_BYTE = 9
BYTES = 2
DESCRIPTION = "Earth received time day of the first bit of the telemetry
   frame which contained the first pixel of this line as interpolated from
   the ERT in the GCF block containing this bit.  (The first bit of the
   frame is the first bit of the sync code.)"
END_OBJECT
```

```
OBJECT = COLUMN
NAME = EARTH_RECEIVED_TIME_HOUR
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 11
BYTES = 1
DESCRIPTION = "Earth received time hour of the first bit of the telemetry
   frame which contained the first pixel of this line as interpolated from
   the ERT in the GCF block containing this bit.  (The first bit of the
   frame is the first bit of the sync code.)"
END_OBJECT

OBJECT = COLUMN
NAME = EARTH_RECEIVED_TIME_MIN
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 12
BYTES = 1
DESCRIPTION = "Earth received time minute of the first bit of the telemetry
   frame which contained the first pixel of this line as interpolated from
   the ERT in the GCF block containing this bit.  (The first bit of the
   frame is the first bit of the sync code.)"
END_OBJECT

OBJECT = COLUMN
NAME = EARTH_RECEIVED_TIME_SEC
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 13
BYTES = 1
DESCRIPTION = "Earth received time second of the first bit of the telemetry
   frame which contained the first pixel of this line as interpolated from
   the ERT in the GCF block containing this bit.  (The first bit of the
   frame is the first bit of the sync code.)"
END_OBJECT

OBJECT = COLUMN
NAME = EARTH_RECEIVED_TIME_MSEC
DATA_TYPE = LSB_UNSIGNED_INTEGER
START_BYTE = 14
BYTES = 2
DESCRIPTION = "Earth received time millisecond of the first bit of the
   telemetry frame which contained the first pixel of this line as
   interpolated from the ERT in the GCF block containing this bit.
   (The first bit of the frame is the first bit of the sync code.)"
END_OBJECT

OBJECT = COLUMN
NAME = SPACECRAFT_CLK_CNT_RIM
DATA_TYPE = LSB_UNSIGNED_INTEGER
START_BYTE = 16
BYTES = 4
DESCRIPTION = "Spacecraft clock RIM readout of the first minor frame of
   this line."
END_OBJECT

OBJECT = COLUMN
NAME = SPACECRAFT_CLK_CNT_MOD91
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 20
BYTES = 1
DESCRIPTION = "Spacecraft clock MOD91 readout of the first minor frame of
   this line."
END_OBJECT

OBJECT = COLUMN
NAME = SPACECRAFT_CLK_CNT_MOD10
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 21
BYTES = 1
```

```
DESCRIPTION = "Spacecraft clock MOD10 readout of the first minor frame of
   this line."
END_OBJECT

OBJECT = COLUMN
NAME = SPACECRAFT_CLK_CNT_MOD8
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 22
BYTES = 1
DESCRIPTION = "Spacecraft clock MOD8 readout of the first minor frame of
   this line."
END_OBJECT

OBJECT = COLUMN
NAME = FILLER
DATA_TYPE = CHARACTER
START_BYTE = 23
BYTES = 59
DESCRIPTION = "Filler"
END_OBJECT

OBJECT = COLUMN
NAME = FORMAT_ID
DATA_TYPE = LSB_UNSIGNED_INTEGER
START_BYTE = 82
BYTES = 2
DESCRIPTION = "16-bit corrected telemetry format id from the minor frame of
   this line."
END_OBJECT

OBJECT = COLUMN
NAME = INPUT_TYPE
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 84
BYTES = 1
DESCRIPTION = "Input type. 0:Spacecraft flight data MOS; 1:PTM data;
   2:Ext. Simulation; 3:Spacecraft flight data test; 4:Internal
   simulation; 5-255: Not used."
END_OBJECT

OBJECT = COLUMN
NAME = INPUT_SOURCE
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 85
BYTES = 1

 OBJECT = BIT_COLUMN
 NAME = SFDU_DATA
 BIT_DATA_TYPE = UNSIGNED_INTEGER
 START_BIT = 1
 BITS = 1
 DESCRIPTION = "Standard formatted data units. 0:not present; 1:present."
 END_OBJECT

 OBJECT = BIT_COLUMN
 NAME = WBDL_DATA
 BIT_DATA_TYPE = UNSIGNED_INTEGER
 START_BIT = 2
 BITS = 1
 DESCRIPTION = "Wide band data link. 0:not present; 1:present."
 END_OBJECT

 OBJECT = BIT_COLUMN
 NAME = SDR_TAPE
 BIT_DATA_TYPE = UNSIGNED_INTEGER
 START_BIT = 3
 BITS = 1
```

```
 DESCRIPTION = "System data record tape. 0:not present; 1:present."
 END_OBJECT

 OBJECT = BIT_COLUMN
 NAME = IDR_TAPE
 BIT_DATA_TYPE = UNSIGNED_INTEGER
 START_BIT = 4
 BITS = 1
 DESCRIPTION = "Intermediate data record tape. 0:not present; 1:present."
 END_OBJECT

 OBJECT = BIT_COLUMN
 NAME = EXPERIMENT_DATA_RECORD
 BIT_DATA_TYPE = UNSIGNED_INTEGER
 START_BIT = 5
 BITS = 1
 DESCRIPTION = "Experiment data record - reprocessed data.  0:not present;
   1:present."
 END_OBJECT

 OBJECT = BIT_COLUMN
 NAME = REALTIME
 BIT_DATA_TYPE = UNSIGNED_INTEGER
 START_BIT = 6
 BITS = 1
 DESCRIPTION = "Real time subsystem.  0:not present; 1:present."
 END_OBJECT

 OBJECT = BIT_COLUMN
 NAME = ASYNCHRONOUS_PLAYBACK
 BIT_DATA_TYPE = UNSIGNED_INTEGER
 START_BIT = 7
 BITS = 1
 DESCRIPTION = "Asynchronous playback. 0:not present; 1:present."
 END_OBJECT

 OBJECT = BIT_COLUMN
 NAME = FILLER
 BIT_DATA_TYPE = UNSIGNED_INTEGER
 START_BIT = 8
 BITS = 1
 DESCRIPTION = "Unused bit - filler"
 END_OBJECT

END_OBJECT

OBJECT = COLUMN
NAME = ALLOCATED_SYNC_CODE_ERRORS
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 86
BYTES = 1
DESCRIPTION = "The number of sync code errors allowed in frame synching."
END_OBJECT

OBJECT = COLUMN
NAME = SYNC_CODE_ERROR
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 87
BYTES = 1
DESCRIPTION = "The total number of bits in the sync code of the minor frame
  for this line which deviate from the standard sync code."
END_OBJECT

OBJECT = COLUMN
NAME = SSI_LOW_RATE_SCIENCE_PACKET
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 88
```

```
BYTES = 1
ITEMS = 12
DESCRIPTION = "SSI LRS packet.  Present only for the first line of each
   MOD91 count.  Otherwise zero."
END_OBJECT

OBJECT = COLUMN
NAME = LAST_PIXEL_SAMPLE_POSITION
DATA_TYPE = LSB_UNSIGNED_INTEGER
START_BYTE = 100
BYTES = 2
DESCRIPTION = "Element position (1-800) of the last pixel in this line
   not artificially set to zeroes or interpolated by MIPS processing.
   Set to zero for missing lines."
END_OBJECT

OBJECT = COLUMN
NAME = SYNC_STATUSES
DATA_TYPE = LSB_UNSIGNED_INTEGER
START_BYTE = 102
BYTES = 2

 OBJECT = BIT_COLUMN
 NAME = SYNC_STATUS_NUMBER_OF_ERRORS
 BIT_DATA_TYPE = UNSIGNED_INTEGER
 START_BIT = 1
 BITS = 14
 DESCRIPTION = "Number of errors in 64-bit frame id"
 END_OBJECT

 OBJECT = BIT_COLUMN
 NAME = SYNC_STATUS
 BIT_DATA_TYPE = UNSIGNED_INTEGER
 START_BIT = 15
 BITS = 2
 DESCRIPTION = "00 (or 0 decimal) - Fully synched;
    01 (or 1 decimal) - Partially synched; 11 (or 3 decimal) - Unsynched."
 END_OBJECT

END_OBJECT

OBJECT = COLUMN
NAME = TRUNCATION
DATA_TYPE = LSB_UNSIGNED_INTEGER
START_BYTE = 104
BYTES = 4

 OBJECT = BIT_COLUMN
 NAME = TRUNCATION_BLOCK_ZERO
 BIT_DATA_TYPE = UNSIGNED_INTEGER
 START_BIT = 1
 BITS = 2
 DESCRIPTION = "Number of truncated bits in block 0 due to data compression"
 END_OBJECT

 OBJECT = BIT_COLUMN
 NAME = TRUNCATION_BLOCK_ONE
 BIT_DATA_TYPE = UNSIGNED_INTEGER
 START_BIT = 3
 BITS = 2
 DESCRIPTION = "Number of truncated bits in block 1 due to data compression"
 END_OBJECT

 OBJECT = BIT_COLUMN
 NAME = TRUNCATION_BLOCK_TWO
 BIT_DATA_TYPE = UNSIGNED_INTEGER
 START_BIT = 5
```

```
BITS = 2
DESCRIPTION = "Number of truncated bits in block 2 due to data compression"
END_OBJECT

OBJECT = BIT_COLUMN
NAME = TRUNCATION_BLOCK_THREE
BIT_DATA_TYPE = UNSIGNED_INTEGER
START_BIT = 7
BITS = 2
DESCRIPTION = "Number of truncated bits in block 3 due to data compression"
END_OBJECT

OBJECT = BIT_COLUMN
NAME = TRUNCATION_BLOCK_FOUR
BIT_DATA_TYPE = UNSIGNED_INTEGER
START_BIT = 9
BITS = 2
DESCRIPTION = "Number of truncated bits in block 4 due to data compression"
END_OBJECT

OBJECT = BIT_COLUMN
NAME = TRUNCATION_BLOCK_FIVE
BIT_DATA_TYPE = UNSIGNED_INTEGER
START_BIT = 11
BITS = 2
DESCRIPTION = "Number of truncated bits in block 5 due to data compression"
END_OBJECT

OBJECT = BIT_COLUMN
NAME = TRUNCATION_BLOCK_SIX
BIT_DATA_TYPE = UNSIGNED_INTEGER
START_BIT = 13
BITS = 2
DESCRIPTION = "Number of truncated bits in block 6 due to data compression"
END_OBJECT

OBJECT = BIT_COLUMN
NAME = TRUNCATION_BLOCK_SEVEN
BIT_DATA_TYPE = UNSIGNED_INTEGER
START_BIT = 15
BITS = 2
DESCRIPTION = "Number of truncated bits in block 7 due to data compression"
END_OBJECT

OBJECT = BIT_COLUMN
NAME = TRUNCATION_BLOCK_EIGHT
BIT_DATA_TYPE = UNSIGNED_INTEGER
START_BIT = 17
BITS = 2
DESCRIPTION = "Number of truncated bits in block 8 due to data compression"
END_OBJECT

OBJECT = BIT_COLUMN
NAME = TRUNCATION_BLOCK_NINE
BIT_DATA_TYPE = UNSIGNED_INTEGER
START_BIT = 19
BITS = 2
DESCRIPTION = "Number of truncated bits in block 9 due to data compression"
END_OBJECT

OBJECT = BIT_COLUMN
NAME = TRUNCATION_BLOCK_TEN
BIT_DATA_TYPE = UNSIGNED_INTEGER
START_BIT = 21
BITS = 2
DESCRIPTION = "Number of truncated bits in block 10 due to data compression"
END_OBJECT
```

```
 OBJECT = BIT_COLUMN
 NAME = TRUNCATION_BLOCK_ELEVEN
 BIT_DATA_TYPE = UNSIGNED_INTEGER
 START_BIT = 23
 BITS = 2
 DESCRIPTION = "Number of truncated bits in block 11 due to data compression"
 END_OBJECT

 OBJECT = BIT_COLUMN
 NAME = TRUNCATION_BLOCK_TWELVE
 BIT_DATA_TYPE = UNSIGNED_INTEGER
 START_BIT = 25
 BITS = 2
 DESCRIPTION = "Number of truncated bits in block 12 due to data compression"
 END_OBJECT

 OBJECT = BIT_COLUMN
 NAME = FILLER
 BIT_DATA_TYPE = UNSIGNED_INTEGER
 START_BIT = 27
 BITS = 2
 ITEMS = 3
 DESCRIPTION = "Six bits to fill out the VAX unsigned integer"
 END_OBJECT

END_OBJECT

OBJECT = COLUMN
NAME = TRUNCATED_PIXELS
DATA_TYPE = LSB_UNSIGNED_INTEGER
START_BYTE = 108
BYTES = 2
DESCRIPTION = "Total number of pixels truncated at end of line due to
          data compression."
END_OBJECT

OBJECT = COLUMN
NAME = CATALOG_VERSION
DATA_TYPE = LSB_UNSIGNED_INTEGER
START_BYTE = 110
BYTES = 2
DESCRIPTION = "Catalog version for identical images."
END_OBJECT

OBJECT = COLUMN
NAME = GCF_SIGNAL_TO_NOISE_RATIO
DATA_TYPE = LSB_UNSIGNED_INTEGER
START_BYTE = 112
BYTES = 2
DESCRIPTION = "GCF symbol signal to noise ratio."
END_OBJECT

OBJECT = COLUMN
NAME = DEEP_SPACE_NETWORK_ID
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 114
BYTES = 1
DESCRIPTION = "Deep space network station id."
END_OBJECT

OBJECT = COLUMN
NAME = IMAGE_LINE_NUMBER
DATA_TYPE = LSB_UNSIGNED_INTEGER
START_BYTE = 115
BYTES = 2
DESCRIPTION = "Image line number (1-800)."
```

```
END_OBJECT

OBJECT = COLUMN
NAME = REED_SOLOMON_OVERFLOW_FLAG
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 117
BYTES = 1
DESCRIPTION = "Reed / Solomon overflow error flag. 1 = Overflow occurred."
END_OBJECT

OBJECT = COLUMN
NAME = RESERVED
DATA_TYPE = UNSIGNED_INTEGER
START_BYTE = 118
BYTES = 1
ITEMS = 83
DESCRIPTION = "Reserved."
END_OBJECT

END_OBJECT   /* LINE_PREFIX_TABLE */
```

3.2.2.5.3 BADDATA.TXT

This is a textual file that describes the structure and content of the bad data value header which follows the telemetry header and precedes the image records. (See Appendix C).

3.2.2.6 VICAR2.TXT

This is a textual file that describes the structure and content of the image header which precedes the telemetry header and precedes the image records. (See Appendix D).

Appendix A

RECOMMENDED CD-ROM DRIVES AND DRIVER SOFTWARE

The following table lists drives and driver software MIPS has employed successfully on various systems using SSI REDR CD-ROMs.

System	Drive	Driver	Comments
VAX/VMS	Digital Equipment Corp. (DEC) RRD40, RRD42, or RRD50.	DEC VMS CD-ROM driver V5.5 and up.	For VMS 5.4 or earlier, contact PDS user support for the driver.
VAX/Ultrix.	DEC RRD40, RRD42, or RRD50	Supplied with Ultrix 3.1.	Can use the "cdio" software package (in "~ftp/src/ cdio.shar" from the "space. mit.edu" server) to access data.
IBM PC	Toshiba (v. 2.2.1), Hitachi, Sony, NEC, Pioneer or compatible.	Microsoft MSCDEX version 2.0 or later (2.21 is the latest version).	
Apple Macintosh	Apple CD SC Plus (3.1.1b3), NEC (2.25), Pioneer DRM600 (CLD Access 1.1b1) or Toshiba (1.4).	Apple CD-ROM driver or vendor specific driver.	
Sun Micro (SunOS 4.0x and earlier)	Delta Microsystems SS-660 (Sony).	Delta Microsystems driver.	For questions concerning this driver, contact Denis Down at Delta Microsystems, 415-449-6881.
Sun Micro (SunOS 4.0.3 and later)	Sun Microsystems SS-660 (Sony).	SunOS sr.o driver.	A patch is needed for the SunOS in order to be able to access files containing Extended Attribute Records. A copy of the patch is available via anonymous ftp from the "space.mit.edu" server in the file named "src/SunOS.4.x.CD-ROM.patch"
Silicon Graphics IRIS	SGI CD-ROM drive.	SGI CD-ROM driver.	A patch is needed for the SGIOS in order to be able to access files containing Extended Attribute Records. A copy of this patch is available by calling the PDS user support. This patch is not needed for Version 4.0.5 and above.
IBM RS6000		See comment.	In order to access PDS CD-ROMs, you need to contact IBM user support for the driver at 1-800-426-7378. AIX 3.2 and above will work with PDS CD-ROMs.

APPENDIX B

SUPPORT STAFF AND COGNIZANT PERSONS

B.1 Support Staff

The following table lists the support staff according to the information required by the user.

Information Required	Contact/Address
How to read the CD-ROM	Data Distribution Laboratory MS 525-3610 Jet Propulsion Laboratory 4800 Oak Grove Drive Pasadena, CA 91109 818-306-3603 Electronic mail addresses: Internet: DDL@stargate.jpl.nasa.gov
MIPS products	Lisa Wainio MS 168-514 Jet Propulsion Laboratory 4800 Oak Grove Drive Pasadena, CA 91109 818-354-5398 Electronic mail addresses: SPAN: MIPL3::LAW320 Internet: law320@ipl.jpl.nasa.gov
Information abour other PDS Data Products:	PDS Operator MS 525-3610 Jet Propulsion Laboratory 4800 Oak Grove Drive Pasadena, CA 91109 818-306-6130 Electronic mail addresses: NSI/DECnet: JPLPDS::PDS_OPERATOR

B.2 Cognizant Persons

Cognizant persons are listed as follows:

The Galileo Project Solid State Imaging (SSI) Team supplied the relevant data and information used to populate the files on the CD-ROMs.

The original PDS labels and the tables were designed jointly by the Planetary Data System's JPL Imaging Node and Object Review Committee, and the Multimission Image Processing Laboratory. Participants included: Sheri Kazz, Gary Yagi, Rosana Borgen, Margaret Cribbs, Steve Hughes, Justin McNeill, Helen Mortensen, Jason Hyon, Mike Martin, Ruth Monarrez and Gail Woodward. Updates were made by Sue Hess and Helen Mortensen.

Software to generate the PDS image labels, index table and format files was developed at the Multimission Image Processing Laboratory by Justin McNeill.

The descriptive information included in the AAREADME.TXT, the VOLDESC.SFD, and the index table label were written by Larry Bolef (Solid State Imaging Team) and Lisa Wainio (Multimission Image Processing Laboratory).

Appendix C

BAD DATA VALUE HEADER DESCRIPTIONS

The following memorandum describes the format and content of the bad data value header of the Galileo SSI REDR images.

JET PROPULSION LABORATORY INTEROFFICE MEMORANDUM
384-91-3:GMY
May 14, 1991

To: Distribution
From: Gary Yagi
Subject: Tracking GLL SSI Bad-Data Values, Binary Label Design, Revision 2

Revision summary: Reed-Solomon overflow records are defined as a new bad data type. These are encoded as line segments (CODE=2) with RECORD-ID=7.

References:
1) "Tracking GLL SSI Bad-Data Values, a Preliminary Design", G. Yagi, April 3, 1989.
2) SSI Experiment Data Record, Galileo SIS 232-07.
3) "Galileo SSI UDR file format", Payam Zamani, 10 April 89.
4) "VICAR Run-Time Library Reference Manual", D. Stanfill, June 10, 88.

This memo defines the format and contents of the binary labels used to store SSI bad-data values, as proposed in Reference 1.

There are two parts to the binary label: the binary header, and the binary prefix (see Ref. 4, Sec. 2.1.2). The binary header precedes the image data (as do the ASCII labels) and contains information which pertain to the entire image. The binary prefix precedes each image line and contains information specific to each line. Binary labels are created by adding the U_NLB and U_NBB keywords to the XVOPEN call. Binary labels are accessed from a file already containing them by adding the CONDITION, BINARY keywords to the XVOPEN call. Note that since VICAR programs do not normally include these keywords in their XVOPEN calls, binary labels are usually ignored and disappear when new versions of an image are created. Binary labels were originally designed to support the generation of Voyager EDRs.

The binary header consists of an arbitrary number of records. The first record contains ancillary telemetry information and the image histogram (Ref. 2). The remaining binary header records contain bad-data information, stored as a sequence of "objects" in 16-bit integer format. The following types of objects have been defined:

OBJECT TYPE	CODE	FORMAT
Single pixels	1	line,sample
Line segments	2	line,starting-sample,number-of-samples
Column segments	3	sample,starting-line,number-of-lines

These objects are used to encode the following bad-data types:

BAD-DATA TYPE RECORD-ID CREATED BY:

Data drop-outs	3	GALSOS
Saturated pixels	4	GALSOS
Low-full-well pixels	5	GALSOS
Single-pixel spikes	6	ADESPIKE
Reed-Solomon overflow	7	GALSOS

Single-pixel spikes are stored as single pixels, data drop-outs, saturated pixels, and Reed-Solomon overflow records are stored as line segments, and low-full-well pixels as column segments.

Note: If a Reed-Solomon overflow occurs on a given line, it will cause the line to pass through the R-S decoder uncorrected. For compressed image data, all pixels to the right of the first bit error will be corrupted. Since it is not possible to determine where this bit error occurs, the entire line is flagged as bad.

Each record will be in 16-bit integer data format and will contain only one type of object. The first three integers of each record contain the record ID, object code (CODE), and the number of objects in the record (N), respectively. The remainder of the record will contain a sequence of N objects. The maximum number of objects which can be stored on a record is a function of the EDR record length and object code. Full-frame and summation-mode EDRs have record lengths of 1800 bytes and 1000 bytes, respectively:

CODE	FULL-FRAME MAX OBJECTS	SUMMATION-MODE MAX OBJECTS
1	448	248
2	299	165
3	299	165

If more objects of a certain type exist, they are written on subsequent records. The records are not necessarily written in any particular order, although they must all precede the image line records.

Example 1: Let a binary header record contain the sequence of integers 6,1,3,211,104,322,111,401,233. The record contains single-pixel spikes (6) encoded as single-pixels (1). There are three objects encoded as line-sample coordinates: (211,104), (322,111), and (401,233).

Example 2: Let a binary header record contain the sequence of integers 4,2,2,110,216,105,789,420,381. The record contains saturated pixels (4) encoded as line segments (2). There are two objects. The first line segment is on line 110 and from sample 216 to 320. The second line segment is on line 789 and from sample 420 to 800.

Example 3: Let a binary header record contain the sequence of integers 5,3,2,299,710,91,521,72,729. The record contains low-full-well pixels (5) encoded as column segments (3). There are two objects. The first column segment is on sample 299 and from lines 710 to 800. The second column segment is on sample 521 and from lines 72 to 800.

The following is an example of a program which reads an image containing bad-data information, does something with this information, and outputs an image which does not contain any binary labels (all subroutines other than XV routines are fictitious):

```
COMMON / HDRREC / RECORDID,CODE,NOBJECTS,SPIX(2,448)    !Binary header record
INTEGER*2 RECORDID,CODE,NOBJECTS,SPIX
```

```
INTEGER*2 BUF(900),LSEG(3,299),CSEG(3,299)
EQUIVALENCE (BUF,RECORDID),(SPIX,LSEG,CSEG)

COMMON / IMGREC / LHDR(100),PIXELS(800)            !Image line record
INTEGER*2 LHDR,PIXELS,LBUF(900)
EQUIVALENCE (LBUF,LHDR)

CALL XVUNIT(IUNIT,'INP',1,IND)
CALL XVOPEN(IUNIT,IND,'COND','BINARY')
CALL XVGET(IUNIT,IND,'NL',NL,'NS',NS,'NLB',NLB)

DO L=2,NLB  !Loop through the binary header records
  CALL XVREAD(IUNIT,BUF,IND,'LINE',L)
  IF (CODE.EQ.1) CALL SINGLE_PIXEL(SPIX,RECORDID,NOBJECTS)
  IF (CODE.EQ.2) CALL LINE_SEGMENT(LSEG,RECORDID,NOBJECTS)
  IF (CODE.EQ.3) CALL COLUMN_SEGMENT(CSEG,RECORDID,NOBJECTS)
ENDDO

CALL XVUNIT(OUNIT,'OUT',1,IND)
CALL XVOPEN(OUNIT,IND,'OP','WRITE')

DO L=1,NL       !Loop through each image line record
  CALL XVREAD(IUNIT,LBUF,IND)    !Read a line record
  CALL PROCESS_LINE(PIXELS,NS)   !Process the image line
  CALL XVWRIT(OUNIT,PIXELS,IND)  !Write the image line
ENDDO
```

Appendix D

GALILEO SSI FLIGHT LABEL

The following is the VICAR2.TXT file which describes the SSI VICAR label of the Galileo REDR images.

INTRODUCTION

This file describes the organization and content of the Galileo SSI flight label for REDR and EDR images. This label is based on the Video Image Communication and Retrieval (VICAR) image processing label standard. Label items, their meanings and values, are described in this document.

ACRONYMS

ASCII	American Standard Code for Information Interchange
CD	Compact Disc
EDR	Experiment Data Record
GLL	Galileo Project
ICAT	MIPS Galileo SSI Image Catalog
MIPS	Multimission Image Processing Subsystem
REDR	Raw Experiment Data Record
RTS	MIPS Realtime system
SPICE	MIPS Navigation software based on NAIF SPICE kernels
SSI	Solid State Imaging camera
VICAR	Video Image Communication and Retrieval

VICAR LABEL STRUCTURE

The VICAR label is a string of ASCII characters consisting of free-field items of the form "keyword = value" separated by spaces. It contains data set description system information regarding the dimensions, organization and data format. This information is written to the label with the following keywords:

LBLSIZE	Size of the label in bytes
FORMAT	Data format (byte, halfword, real, fullword, etc.)
TYPE	Data set type (image, parameter, histogram, plot, etc.)
BUFSIZ	Internal blocksize VICAR will use during input/output
DIM	Data set dimension
EOL	End-of-dataset label
RECSIZE	Data set record size
ORG	Data set organization
NL	Number of lines or records
NS	Number of samples or record length
NB	Number of bands or number of data planes
NBB	Number of binary prefix bytes
NLB	Number of binary header records
N1	Equal to NS
N2	Equal to NSL for BSQ, NB for BIL and NS for BIP
N3	Equal to NB for BSQ or NL for BIL and BIP
N4	Not used
HOST	Type of computer used to generate the image.

INTFMT	The format used to represent integers in the file.
REALFMT	The format used to represent floating point numbers.
BHOST	Type of computer used to generate the binary information
BINTFMT	The format used to represent integers in the file.
BREALFMT	The format used to represent integers in the file.
BLTYPE	The binary label type. Currently not implemented.

The VICAR label also contains processing history information on the file describing the application programs or procedures which have processed the data set, the user parameters of the respective programs or procedures, the user identification and processing date and time. The following VICAR label items are used to describe history information for each program or procedure executed:

TASK	Program or procedure that has processed the data set
USER	User identification
DAT_TIM	Processing date and time
opt. items	VICAR label items added by application program or procedure listed under the respective task

The following is the lastest memorandum describing the SSI VICAR label. The memorandum describes both the SSI Ground-Calibration label and the Flight label. PDS labels contained in this CD data set are flight labels.

JET PROPULSION LABORATORY

INTEROFFICE MEMORANDUM
MSD:384-90-131
7 June 1990

To: Distribution
From: Gary Yagi
Subject: Galileo SSI Picture Label, Revision 4

References:
1) "Preliminary Mask Definition for Galileo SSI Systematic Color Hardcopy Products", Ken Klaasen and Jim Anderson, 13 October 1987.
2) "Designing the Galileo VICAR image label", Doug Alexander, IOM, 18 April 1988.

INTRODUCTION: This memo documents the format and contents of the Galileo SSI ground-calibration label and flight image label. The purpose of these labels and requirements for label maintenance are also addressed.

PURPOSE OF THE PROJECT LABEL: All digital images stored in standard VICAR format are preceded by a picture label. The label consists of picture descriptors and processing history information stored in ASCII.

Flight projects have traditionally designed special label formats to identify the mission, spacecraft, instrument, target, and frame, and to include various camera and image geometry information pertinent to the interpretation of the image. The project labels are attached to each new image received via the real-time system, or from EDR or ground-calibration tapes. Consequently, these labels normally precede all other labels. This memo is concerned specifically with these project labels, and does not address other labels added by VICAR or application programs during processing.

During systematic and science processing, individual programs may extract and use various image identifiers and camera parameters stored in the label. The image geometry information included in the label is ignored during processing, since more accurate information is available in the project SEDR or SPICE files.

As each new version of an image is produced, the VICAR system will automatically copy the picture label and add the program name, user name, and date to the processing history. In addition, individual programs may add processing information to the label.

The image label may be printed by executing LABLIST or LABEL-LIST on the image. Unless a rigid file-name nomenclature is adhered to, this image label is the only means of identifying an image stored on disk.

GALILEO SSI GROUND-CALIBRATION LABEL: The ground-calibration picture label is generated by program VGLLOG, which reads tapes generated by the Galileo Sensor Test Set (STS) and converts the file to standard VICAR image format.

```
LAB01=GLL/SSI S/N=F29 LEVEL=SUBSYSTEM  10:59:15  MAY  19, 1985 FRAME61              C
LAB02=TEST=LIGHT TRANSFER C TARGET=TUNG L SOURCE=LC 70VR  FR.RATE=8 2/3           C
LAB03=EXP=0       MSEC(***) GAIN=1(400K) PNI=    BPM=OFF  FILTER=0(CLR)              C
LAB04=BARC=OUT(RAT) SUM=OFF      EXPAND=OFF  IN=GL0353/61 OUT=GC1109/61            C
```

```
LAB05= CCDTF=119  CCDTC=50    INN=**  +50VDC=**  +15VDC=**                 C
LAB06=-15VDC=**  +10VDC=**  +5VDC=**   -5VDC=**  CCDHEV=** BLSCV=**        C
LAB07=ADCRFV=**    VDD=**   VREF=**    VCC=**    VEF=**   ROPT=**          C
LAB08=DESCRIPTOR=DARK FRAME, 8 C, 8 2/3 SEC, 100K, INVERTED                L
NLABS=8
```

Appendix 1 presents a brief description of each label item. The ground-calibration label follows a convention used to support old label formats originally used on the IBM (before 1984). The project labels are stored as label items LAB01, LAB02, LAB03, etc. Each LABXX item consists of a 72-character ASCII strings. The 71st character is a label type flag used by some programs (e.g. MASKV) to control which labels are displayed or printed. The last character in each string is a 'C' (for continue) or 'L' (for last). However, note that the additional label item NLABS should be used to indicate how many project labels are present.

GALILEO SSI FLIGHT LABEL: The flight label is in free format, with each label item stored in the form "keyword=value". A brief description of each label item is provided in Appendix 2.

Summation-mode frames can be identified by their 2 1/3 frame rate.
The majority of the label items are generated by the Real-Time subsystem's Image-Builder program. Label items DC, CAL, SO, BLM, IOF, CNV, and UBWC are added by GALSOS. If the image is read from an EDR tape, label items EDRTAPE and EDRFILE are added by GEDREAD.

When an image is map-projected, the following label items relating to image geometry must be updated (by MAP2): SUNAZ, SMRAZ, SCAZ, NORAZ, SMR, LAT, LON, HSCL, VSCL.

A special program will have to be written to list the label items in a standard format at the terminal or on hardcopy. The following is theproposed format:

```
GLL/SSI  PICNO=12A0001    FILTER=3(VIO)  TLMFMT=XXX    TARGET=CALLISTO
RIM=16777215:90:9:7       EXP=51200.00   FIBE=1001     TCA=-003 23:13:00
SCET=95.123 12:23:56      GAIN=1(400K)   BARC=RC       TRUNC BITS/PXL=2.34
PA=NNIOOOOOO#MMSSSSXXXX   RATE=60 2/3    ENTRPY=2.23   TRUNC PXLS/LNE=123
INA= 89.12  TWST=359.99   SUNAZ=359.99   BOOM=NO       HSCL=1.2345E5 M/PXL
EMA=180.00  CONE=179.99   SMRAZ=359.99   SMEAR=99.99   VSCL=1.2345E5 M/PXL
PHA=179.33  RA=359.99     S/CAZ=359.99   LAT=-90.00    PLANETRNG=123456789
HRA=130.31  DEC=-90.00    NORAZ=359.99   LON=359.99    SLANT RNG=123456789
CAL=RADIOMETRIC-FILENAME  IOF=1.0000E-3  UBWC=YES      SOLAR RNG=123456789
DC=DARKCURRENT-FILENAME   CNV=3.5135E-2
BLM=BLEMISH-FILENAME      SO=SHUT-OFFSET-FILENAME      EDR=GLL6622/066
```

APPLICATION PROGRAM/LABEL INTERFACES: Label items may be stored, retrieved, or deleted via subroutines XLADD, XLGET, or XLDEL, respectively. Subroutine VIC1LAB may be used to retrieve all ground-calibration labels. The subroutine ABLE86 will extract specific information from either flight or ground-calibration labels and return the results in an array (e.g. filter position). The help file for ABLE86 is included as APPENDIX 3. Note that programs that support more than one mission (e.g. Voyager and Galileo) should not call ABLE86 directly, but use GETLABCON instead.

APPENDIX 1: DESCRIPTION OF GLL SSI GROUND-CALIBRATION LABEL ITEMS

LABEL ITEM	DESCRIPTION
S/N=F29	CCD identifier (F29=flight unit)
LEVEL=SUBSYSTEM	Test level: component or subsystem
FRAME61	Frame number (0-99)
TEST=LIGHT TRANSFER C	Test name (16 characters)
TARGET=TUNG	Target name (6 characters)
SOURCE=LC 70VR	Light source/veeder-root
FR.RATE=60 2/3	Frame rate (sec)
EXP=51200.00 MSEC(EXT)	Exposure time (msec), extended or normal
GAIN=1(400K)	Gain state (1-4)
PNI=NOR	Parallel clock (INV=inverted, NOR=normal)
BPM=OFF	Blem-protect (ON or OFF)
FILTER=3(VLT)	Filter position: 0(CLR), 1(GRN), 2(RED), 3(VLT), 4(756), 5(968), 6(727), 7(889)
BARC=OUT(RAT)	Data compressor ON or OUT, (RAT=rate control, IP=information preserving, OFF=compressor off)
SUM=OFF	Summation-mode (ON or OFF)
EXPAND=OFF	(obsolete field)
IN=GL0353/61	Input STS tape/fileno
OUT=GC1109/61	VICAR output tape/fileno
CCDTF=119	????
CCDTC=50	????
DESCRIPTOR=...	Frame descriptor

NOTE: The remaining fields were never implemented.

APPENDIX 2: DESCRIPTION OF GLL SSI FLIGHT LABEL ITEMS

LABEL ITEM	DESCRIPTION	SOURCE
MISSION=string	Mission ID (GLL)	
SENSOR=string	Sensor ID (SSI)	
PICNO=string	Picture number (7 characters)	ICAT
PARTITION=integer	Count of number of times RIM is reset	RTS
RIM=integer	RIM	RTS
MOD91=integer	MOD91	RTS
MOD10=integer	MOD10	RTS
MOD8=integer	MOD8	RTS
PA=string	Profile Activity (20 characters)	ICAT
TCA=string	Time from closest approach (13 characters)	ICAT
TARGET=string	Target-body name (12 characters)	ICAT
SCETYEAR=integer	Spacecraft-Event-Time year	ICAT
SCETDAY=integer	Spacecraft-Event-Time day-of-year	ICAT
SCETHOUR=integer	Spacecraft-Event-Time hour-of-day	ICAT
SCETMIN=integer	Spacecraft-Event-Time minute-of-hour	ICAT
SCETSEC=integer	Spacecraft-Event-Time second-of-minute	ICAT
SCETMSEC=integer	Spacecraft-Event-Time millisecond-of-second	ICAT
FILTER=integer	Filter position (0-7)	RTS
EXP=real	Exposure time (msec)	RTS
GAIN=integer	Gain state code (1-4)	RTS
RATE=integer	Frame rate code (1=2 1/3 sec, 2=8 2/3, 3=30 1/3, 4=60 2/3)	RTS
TLMFMT=string	Telemetry format (3 characters)	RTS

BOOM=string	Boom obscuration (P=possible, N=not possible, V=presence verified)	RTS
FIBE=string	Camera flags (4 characters)	
	F=light flood (1=on, 0=off)	RTS
	I=clock (1=inverted, 0=non-inverted)	RTS
	B=blemish protect (1=on, 0=off)	RTS
	E=extended-exposure (1=extended, 0=normal)	RTS
BARC=string	Data compression mode (3 characters)	RTS
	RC=rate control	
	IP=information preserving	
	OFF=off	
ENTROPY=real	Average entropy level (bits / pixel)	GALSOS
TBPPXL=real	Mean number of truncated bits / pixel	RTS
TPPLNE=integer	Mean number of truncated pixels / line	RTS
INA=real	Incidence angle (0-180)	SPICE
EMA=real	Emission angle (0-180)	SPICE
PHA=real	Phase angle (0-180)	SPICE
HRA=real	Hour angle (0-360)	SPICE
TWIST=real	Twist angle (0-360)	RTS
CONE=real	Cone angle (0-180)	RTS
RA=real	Right-ascension of pointing vector	RTS
DEC=real	Declination of pointing vector	RTS
SUNAZ=real	Sun azimuth (0-360)	SPICE
NORAZ=real	North azimuth (0-360)	SPICE
SCAZ=real	Spacecraft azimuth (0-360)	SPICE
SMRAZ=real	Smear azimuth (0-360)	SPICE
SMEAR=real	Smear magnitude (pixels).	SPICE
HSCL=real	Horizontal picture scale (m / pixel)	SPICE
VSCL=real	Vertical picture scale (m / pixel)	SPICE
LAT=real	Latitude of center of frame (-90-+90)	SPICE
LON=real	Longitude of center of frame (0-360)	SPICE
RAD=real	Ring radius of center of frame (km)	SPICE
PLRANGE=real	Distance from S / C to planet (km)	SPICE
SLRANGE=real	S / C-to-target slant range (km)	SPICE
SOLRANGE=real	Distance from sun to target-body (km)	SPICE
IOF=real	Conversion factor from DN to reflectance	GALSOS
CNV=real	Conversion factor from DN to radiance	GALSOS
UBWC=string	Uneven-bit-weighting correction (ON or OFF)	GALSOS
DC=string	Calibration dark-current file name	GALSOS
CAL=string	Calibration slope file name	GALSOS
BLM=string	Blemish file name	GALSOS
SO=string	Shutter-offset file name	GALSOS
EDRTAPE=string	EDR tape ID (7 characters)	
EDRFILE=integer	EDR file number	

Notes:

1) PARTITION starts with 1 (=0 if unavailable).
2) The MOD10 and SCET refer to the first line of the image.
3) If the target is the ring-plane of Jupiter, label items LAT and LON are replaced by RAD and LON.

SAMPLE OF GALILEO SSI VICAR LABEL

Below is a listing of a sample SSI flight label of an image with a spacecraft clock value of 165192000. MIPS VICAR program LABEL was used to produce this formatted version of the VICAR label.

```
***********************************************************

        ************ File S0165192000.1 ************
                3 dimensional IMAGE file
                File organization is BSQ
                Pixels are in BYTE format from a VAX-VMS host
                1 bands
                800 lines per band
                800 samples per line
                2 lines of binary header
                200 bytes of binary prefix per line
---- Task: CATLABEL -- User: XXX999 -- Wed Mar 31 12:07:34 1993 ----
MISSION='GALILEO'
SENSOR='SSI'
PICNO='E2W0914'
PA='E2WSZOOMMV01-000WDTL'
PARTITION=0
RIM=1651920
MOD91=0
MOD10=1
MOD8=0
TCA='731T10:38:28Z'
TARGET='EARTH'
SCETYEAR=1992
SCETDAY=344
SCETHOUR=7
SCETMIN=13
SCETSEC=1
SCETMSEC=11
FILTER=3
EXP=8.333
GAIN=3
RATE=3
TLMFMT='HCM'
BOOM='P'
FIBE='1000'
BARC='RC'
TBPPXL=0.0
TPPLNE=0.0
INA=60.3112
EMA=19.7927
PHA=80.1038
HRA=-999.0
TWIST=113.394
CONE=0.0
RA=-5.05283
DEC=5.47921
SUNAZ=178.903
NORAZ=66.6094
SCAZ=27.3903
SMRAZ=0.0
SMEAR=-999.0
HSCL=5666.0
```

VSCL=5332.76
LAT=-12.3842
LON=352.885
RAD=0.0
PLRANGE=531069.0
SLRANGE=525184.0
SOLRANGE=1.473261e+08

****

APPENDIX E

GLOSSARY

E.1 Glossary of SSI Keyword Label Definitions

This glossary is intended for usage with the Galileo SSI data only. Each Flight Project instrument may create its' own unique PDS label. The PDS Keyword definitions have been taken from the PDS Data Dictionary (PSDD) or agreed upon by the PDS Object Review Committee (ORC) for inclusion into the next release of the PSDD. The element definitions, datatypes, sizes and values in this glossary are Galileo SSI specific and have been organized to appear in the same sequence as they do in the actual PDS Galileo SSI label. This glossary has been cross referenced with the VICAR label item as well as the MIPS SSI catalog. Each of the MIPS Galileo SSI Catalog keywords come from either the SSI_OVERVIEW or the SSI_CORRECTED domain.

Glossary Format

PDS KEYWORD (datatype field size - MIPS size implementation of the PDS keyword <beginning range, ending range unit of measure>)

Keyword definition

VICAR Label Keyword (datatype field size <beginning range, ending range unit of measure>)
VICAR definition if different from PDS definition

MIPS Galileo SSI Catalog Keyword, Domain (datatype field size <beginning range, ending range unit of measure>)
Catalog definition if different from VICAR definition

DATA_SET_ID (character 40 - MIPS implementation character 28)

The data_set_identification element is a unique alphanumeric identifier for a data set or a data product. The data_set_identification value for a given data set or product is constructed according to flight project naming conventions. In most cases the data_set_id is an abbreviation of the data_set_name.

VICAR = n / a

Catalog = n/a

SPACECRAFT_NAME (character 60 - MIPS implementation character 15)

The spacecraft_name element provides the full, unabbreviated name of a spacecraft "GALILEO ORBITER".

VICAR= MISSION (character 7)
Project or Mission name associated with the data, "GALILEO".

Catalog = n/a

INSTRUMENT_NAME (character 40 - MIPS implementation character 19)

The instrument_name element provides the full name of an instrument, "SOLID_STATE_IMAGING". Note that the associated instrument_identification element provides an abbreviated name or acronym for the instrument, **found also in the CD's index file.**

VICAR = SENSOR (character 3)
Abbreviated name or acronym for the instrument, "SSI".

Catalog = n/a

SPACECRAFT_CLOCK_START_COUNT (character 30 - MIPS implementation character 11)

The spacecraft_clock_start_count element provides the value of the spacecraft clock at the time of frame acquisition. Note: In the PDS, sclk_start_counts have been represented in the following ways: Voyager - Flight Data Subsystem (FDS) clock (floating point 7.2), for Galileo this number is a concatenation of the RIM and MOD91 counters.

VICAR = RIM (0-16777215)
= MOD91(0-90)

Catalog = SCLK (longword)
Spacecraft clock (RIM*100+MOD91)

IMAGE_TIME (time)

The image_time element provides the spacecraft event time at the time of frame acquisition represented in Universal Time Coordinates (UTC) (i.e. yyyy-mm-dddThh:mm:ss.mmmZ).

VICAR = SCETYEAR (integer <1989,2000>)
Spacecraft-Event-Time year
VICAR = SCETDAY(integer <0,365>)
Spacecraft-Event-Time day-of-year
VICAR = SCETHOUR(integer <0,23>)
Spacecraft-Event-Time hour-of-day
VICAR = SCETMIN(integer <0,59>)
Spacecraft-Event-Time minute-of-hour
VICAR = SCETSEC(integer <0,59>)
Spacecraft-Event-Time second-of-minute
VICAR = SCETMSEC(integer <0,999>)
Spacecraft-Event-Time millisecond-of-second

Catalog = SCET_YEAR (signed word <1989,2000>)
UTC year of center of shutter open
Catalog = SCET_DAY (signed word <0,365>)
UTC day of center of shutter open
Catalog = SCET_HOUR (signed word <0,23>)
UTC hour of center of shutter open
Catalog = SCET_MINUTE(signed word <0,59>)
UTC minute of center of shutter open
Catalog = SCET_SECOND (signed word <0,59>)
UTC second of center of shutter open
Catalog = SCET_MILLI (signed word <0,999>)
UTC millisecond of center of shutter open

IMAGE_ID (character 30 - MIPS implementation character 7)

The image_id element is used to identify an image and typically consists of a sequence of characters representing 1) a routinely occurring measure, such as a revolution number, 2) a letter identifying the spacecraft, target or camera, and 3) a representation of a count within the measure, such as picture number within a given revolution. Example: Voyager (pic# for encounter, FDS for cruise)

<u>VICAR = PICNO (character 7)</u>
Picture number
Format: XXYZZZZ
XX = orbit or cruise phase
Y = the target body (J=Jupiter, A=Amalthea, I=IO, E=Europa, G=Gamymede, C=Callisto, S=Minor Satellites, R=Ring, H=Star, L=Moon, W=Earth, V=Venus, U=Ida, P=Gaspra)
ZZZZ = the picture count which is incremented separately for each target body in each orbit.

Catalog = PICNO (character 7)

ORBIT_NUMBER (real - MIPS implementation integer)

The orbit_number element identifies the number of the orbital revolution of the spacecraft, counted since orbit insertion.

<u>VICAR = n/a</u>

Catalog = ORBIT_NUMBER (signed word)

OBSERVATION_ID (character 30 - MIPS implementation character 20)

The observation_id element identifies a specific observation sequence.

<u>VICAR = PA (character 20)</u>
profile activity (format: NNTIOOOOOOMM#SSSXXXX
NN = orbit number
T = scan platform target body initial
I = instrument
OOOOOO = orbit planning guide mnemonic
MM = sequential OAPEL number for each of NNIIOOOOOO
# = multiple observation flag symbol (- or +)
SSS = PA set number
XXXX = MIPS processing code)

Catalog = ACTIVITY_ID (character 20)

TARGET_NAME (character 30 - MIPS implementation character 10)

The target_name element identifies the primary target in the image. The target may be a planet, satellite, ring, region, feature, asteroid or comet.

VICAR = TARGET (character 12)
target-body name

Catalog = TARGET (character 12)

TIME_FROM_CLOSEST_APPROACH (real <-1.E32,1.E32> - MIPS implementation time +/- dddThh:mm:ssZ)

The time_from_closest_approach element provides the time from spacecraft periapsis. The time values are negative prior to periapsis and positive after periapsis.

VICAR = TCA (time)

Catalog = TCA (signed longword)
Time from closest approach to central body (days) +/-DDDHHMMSS

SATELLITE_TIME_FROM_CLST_APR (time ddThh:mm:ssZ - MIPS implementation time +/- dddThh:mm:ssZ)

The satellite_time_from_clst_apr provides the time from closest approach to the nearest satellite. This element can be represented with a negative value (e.g. before the satellite encounter). This element should not be confused with TIME_FROM_CLOSEST_APPROACH which is the time from closest approach to the central body.

VICAR = n/a

Catalog = TCA_SAT (signed longword)
Time from closest approach to nearest satellite (days)+/-DDDHHMMSS

NOTE (character 60)

The note element is a text field which provides miscellaneous notes or comments (for example, concerning a given data set of a given data processing program).

VICAR = n/a

Catalog = n/a

FILTER_NAME (character 20 - MIPS implementation character 7)

The filter_name element provides the commonly used name of the instrument filter through which an image or measurement was acquired or which is associated with a given instrument mode.
Example values: RED, GREEN.

VICAR = n / a

Catalog = PRED_FILTER (character 7) or FILTER (character 7)
Camera filter from predict or Camera filter from telemetry of last received image version

FILTER_NUMBER (character 4 - MIPS implementation integer <0,7>)

The filter_number element provides the filter position number of an instrument filter through which an image or measurement was acquired or which is associated with a given instrument mode. Note: the filter_number is unique, while the filter_name is not.

VICAR = FILTER (integer 5 <0,7>)
(**0**=CLEAR, **1**=GREEN, **2**=RED, **3**=VIOLET, **4**=IR-7560, **5**-IR-9680, **6**=IR-7270, **7**=IR-8890, **?**=?)

Catalog = n/a

EXPOSURE_DURATION (real <0,1.E32 ms>)

The exposure_duration element provides the value of the time interval between the opening and closing of a camera shutter.

VICAR = EXP (real <milliseconds>)
Exposure time (msec) 0-51200

Catalog = PRED_EXPOS (real) or EXPOS_TIME (real)
Exposure time (ms) from predict or Exposure time (ms) from telemetry of last received image version

GAIN_MODE_ID (character 30 - **MIPS implementation character 4)**

The gain_mode_id element identifies the gain state of an instrument. Gain is a constant value which is multiplied with an instrument's output signal to increase or decrease the level of that output.

VICAR = GAIN (character 4)
Gain state code (1-4)
Example values: **1**=400K, **2**=100K, **3**=40K, **4**=10K

Catalog = PRED_GAIN (character 4) or GAIN_STATE (character 4)
Instrument gain state from predict or Instrument gain state from telemetry of last received image version
Example values: 10K, 40K, 100K, 400K

FRAME_DURATION (real)

The frame_duration element provides the identification of different internal rates of acquiring data for an instrument. For example, the rate at which an imaging instrument acquires an image (by scanning the vidicon or CCD raster).
Example values: 2.333, 8.667, 30.333, 60.667

VICAR = RATE (integer 1 <1,4>)
Frame rate code
Example values: **1**=2 1/3 sec, **2**=8 2/3, **3**=30 1/3, **4**=60 2/3

Catalog = PRED_IMAGING (real <second>) or IMAGING_MODE (real <second>)
Imaging mode (seconds) from predict or Imaging mode (seconds) from telemetry of last received image version
Example values: 2.333, 8.667, 30.333, 60.667 seconds

LIGHT_FLOOD_STATE_FLAG (character 3)

The light_flood_state_flag element indicates whether the light flood was **on**, **off** or **unk**nown

VICAR = **F**IBE (character 4)
FIBE consists of four binary camera states: **Flood**, Inverted-mode, Blem-protect mode, Extended-exposure (e.g. **1**001) **F**=light flood (1=on, 0=off)

Catalog = LIGHT_FLOOD (character 3)
Example values: ON, OFF, ?

EXPOSURE_TYPE (character 8)

The exposure_type element indicates whether the camera was set for **extended**, **normal** exposure or **unk**nown.

VICAR = FIB**E** (character 4)
FIB**E** consists of four binary camera states: Flood, Inverted-mode, Blem-protect mode, **Extended-exposure** (e.g. 100**1**) E=extended-exposure (1=extended, 0=normal)

Catalog = EXPOS_MODE (character 3)
Example values: NOR = normal, EXT = extended, ?

BLEMISH_PROTECTION_FLAG (character 3)

The blemish_protect_flag element indicates whether the blemish protect was **on**, **off** or **unk**nown.

VICAR = FI**B**E (character 4)
FI**B**E consists of four binary camera states: Flood, Inverted-mode, **Blem-protect mode**, Extended-exposure (e.g. 10**0**1) B = blem (1=on, 0=off)

Catalog = BLEM_PROTECT (character 3)
Example values: ON, OFF, ?

INVERTED_CLOCK_STATE_FLAG (character 12)

The inverted_clock_state_flag element indicates whether the clock was **inverted**, **not inverted** or **unk**nown thus indicating the flow of current.

VICAR = F**I**BE (character 4)
F**I**BE consists of four binary camera states: Flood, **Inverted-mode**, Blem-protect mode, Extended-exposure (e.g. 1**0**01), I = clock (1= inverted, 0= not-inverted)

Catalog = CLOCK_STATE (character 3)
Example values: NOR = normal, INV = inverted, ?

ENCODING_TYPE (character 24 - MIPS implementation character 22)

The encoding_type element indicates the type of compression or encryption used for data storage.
Example values: information preserving, rate control, off, unk

VICAR = BARC (character 3)
Block Adaptive Rate Control data compression mode
Example values: RC = Rate Control, IP = Information Preserving, OFF = off, ?

Catalog = COMP_MODE (character 3)

ENTROPY (real <0,180>)

The entropy element identifies the average entropy level (bits / pixel). Entropy is a measure of scene activity. It applies to the entire image.

VICAR = ENTROPY (float <0,8.0 bits / pixel>)
Average entropy level (bits / pixel) for the entire image.

Catalog = ENTROPY (real)

MEAN_TRUNCATED_BITS (real)

The mean_truncated_bits element provides the mean number of truncated bits / pixel.

VICAR = TBPPXL (float <0,4.0 bits / pixel>)

Catalog = TBITS_PIXEL (real)

MEAN_TRUNCATED_SAMPLES (real)

The mean_truncated_samples provides the mean number of truncated pixels / line.

VICAR = TPPLNE (integer <0,800 pixels / line>)

Catalog = TPIXELS_LINE (real)

TELEMETRY_FORMAT_ID (character 3)

The telemetry_format_id element provides a telemetry format code.

VICAR = TLMFMT (character 3)
Example values: 0=**LPB**, 1=**EHR**, 2=**BPB**, 3=**MPB**, 4=**XPW**, 5=**XCM**, 6=**XED**, 7=**XPB**, 8=**XPN**, 9=**XRW**, 10=**HPB**, 11=**HPJ**, 12=**HRW**, 13=**HCJ**, 14=**MPP**, 15=**MPR**, 16=**HPW**, 17=**HIM**, 18=**HCM**, 19=**LRS**, 20=**MPW**, 21=**PW8**, 22=**IM8**, 23=**AI8**, 24=**PW4**, 25=**IM4**, 26= , 27= , 28= , 29=**ESS**, 30=**ELS**, ?=**?**

Catalog = PRED_TLMFMT (character 3) or TLMTRY_FMT (character 3)
Telemetry mode from predict or Telemetry mode from telemetry of last received image version

OBSTRUCTION_ID (character 17)

The obstruction_id element identifies whether a boom obstruction is present, possible or not possible.
Example values: present, possible, not possible, unk

VICAR = BOOM (character 1)
Boom obstruction
Example values: **P**=possible, **N**=not possible, **V**=presence verified)

Catalog = BOOM_OBS (character 1)
Set to 'P' if cone and clock and clock angles are such that boom obscuration is possible, 'N' is not possible, 'V' if presence verified

POSITIVE -LONGITUDE-DIRECTION (character 4)

The positive_longitude_direction element identifies the direction of longitude (e.g.
EAST, WEST) for a planet. The IAU definition for direction of positive longitude is adopted. Typically, for planets with prograde rotations, positive longitude direction is to the West. For planets with retrograde rotations, positive longitude direction is to the EAST.

VICAR = n / a

Catalog = n/a

TARGET_CENTER_DISTANCE (real <0,1.E32 km>)

The target_center_distance element provides the distance between the spacecraft and the center of the named target.

VICAR = n / a

Catalog = SC_TGT_RANGE (real <km>)

CENTRAL_BODY_DISTANCE (real - MIPS implementation real <0,1.E32 km>)

The central_body_distance element provides the range from the spacecraft to the central body center.

VICAR = PLRANGE (real <0,100000000.0 km>)
Distance from spacecraft to planet (km) 0 to 1000000000.0

Catalog = SC_CB_RANGE (real <km>)

SUB_SPACECRAFT_LATITUDE (real <-90,90 degree>)

The sub_spacecraft_latitude element provides the latitude of the subspacecraft point. The subspacecraft point is that point on a body which lies directly beneath the spacecraft.

VICAR = n/a

Catalog = SC_LAT (real <degree>)
Planetocentric subspacecraft latitude of s/c position vector

SUB_SPACECRAFT_LONGITUDE (real <0,360 degree>)

The sub_spacecraft_longitude element provides the longitude of the subspacecraft point. The subspacecraft point is that point on the body which lies directly beneath the spacecraft.

VICAR = n/a

Catalog = SC_LON (real <degree>)
West longitude of spacecraft position vector

TWIST_ANGLE (real <0,360.0 degree>)

The twist_angle element provides the angle of rotation about the optical axis relative to celestial coordinates. The right-ascension, declination, and twist angles define the pointing direction of the scan platform.

VICAR = TWIST (real <0,360.0>)
Twist angle

Catalog = TWIST (real <degree>)
Twist angle (degree), center of shutter open

CONE_ANGLE (real <0,180 degree>)

The cone_angle element provides the value of the angle between the primary spacecraft axis and the pointing direction of the instrument.

VICAR = CONE (real <0,180.0>)
Cone angle

Catalog = CONE_POS (real <degree>)

RIGHT_ASCENSION or RA (real <0,360 degree>)

The right_ascension element provides the right ascension value. Right ascension is defined as the arc of the celestial equator between the vernal equinox and the point where the hour circle through the given body intersects the Earth's mean equator (reckoned eastward).

VICAR = RA (real <0,360.0>)
Right ascension of pointing vector

Catalog = RA (real <degree>)
Right Ascension of SSI optic axis (degree), center of shutter open, J2000

DECLINATION (real <-90,90 degree>)

The declination element provides the value of an angle, corresponding to latitude, used to fix position on the celestial sphere. Declination is measured positive north and negative south of the celestial equator, and is defined relative to a specified reference period or epoch.

VICAR = DEC (real <90.0,-90.0>)
Declination of pointing vector

Catalog = DEC (real <degree>)
Declination of SSI optic axis (degree), center of shutter open, J2000

SUB_SPACECRAFT_LINE (real -1million,1million)

The sub_spacecraft_line element is the image line containing the subspacecraft point.
Note: The Galileo SSI application of this keyword is calculated by CDGEN. A program that creates the PDS label from SPICE data.

VICAR = n/a

Catalog = n/a

SUB_SPACECRAFT_LINE_SAMPLE (real -1million,1million)

The sub_spacecraft_line_sample element is the image sample coordinate containing the subspacecraft point.
Note: The Galileo SSI application of this keyword is calculated by CDGEN. A program that creates the PDS label from SPICE data.

VICAR = n/a

Catalog = n/a

NORTH_AZIMUTH (real <0,360 degree>)

The north_azimuth element provides the value of the angle between a line from the image center to the north pole and a reference line in the image plane. The reference line is a horizontal line from the image center to the middle right edge of the image. This angle increases in a clockwise direction.

VICAR = NORAZ (real <0,360.0>)
North azimuth

Catalog = n/a

SUB_SPACECRAFT_AZIMUTH (real <0,360 degree>)

The sub_spacecraft_azimuth element provides the value of the angle between the projected spacecraft vector and a horizontal reference line (in the image plane) extending from the image center to the middle right edge of the image. The values of this angle increase in a clockwise direction.

VICAR = SCAZ (real <0,360.0>)
Spacecraft azimuth

Catalog = n/a

SMEAR_AZIMUTH (real <0,360. degree>)

The smear_azimuth element indicates the direction in which an image was smeared. The values of this angle increment in a clockwise direction from a horizontal reference line.

VICAR = SMRAZ (real <0,360.0>)
Smear azimuth

Catalog = n/a

SMEAR_MAGNITUDE (real <0,1000 pixels>)

The smear_magnitude element indicates how far the image was smeared in pixels during the exposure.

VICAR = SMEAR (real <0,800 pixels>)

Catalog = SMEAR_MAG (real <pixels>)

HORIZONTAL_PIXEL_SCALE (real <0,1000000000.0 meters / pixel>)

The horizontal_pixel_scale element indicates the horizontal picture scale (meters / pixel).

VICAR = HSCL (real <0,1000000000.0 meters / pixel>)

Catalog = n/a

VERTICAL_PIXEL_SCALE (real <0,1000000000.0 meters / pixel>)

The vertical_pixel_scale element indicates the vertical picture scale (meters / pixel).

VICAR = VSCL (real <0,1000000000.0 meters / pixel>)

Catalog = n/a

SLANT_DISTANCE (real <0,1.E32 km>)

The slant_distance element provides a measure of the distance from the spacecraft to the optical-axis intercept point on the body surface.

VICAR = SLRANGE (real 12 <0,1000000000.0 km>)
Spacecraft to target slant range

Catalog = SLANT_RANGE (real)
Slant range to p5 point (p5 represents the center of the frame)

CENTER_LATITUDE (real <-90,90 degree>)

The center_latitude element provides a reference latitude for certain map projections. For example, in an Orthographic projection, the center_latitude along with the center_longitude defines the point of tangency between the sphere of the planet and the plane of the projection. The map_scale (or map_resolution) is typically defined at the center_latitude or center_longitude. For unprojected flight images, center_latitude refers to the latitude at the center of the frame.

VICAR = LAT (real <-90,90>)
Latitude of center of frame.

Catalog = C_LAT (real <degree>)
Planetocentric latitude of p5 point (p5 represents the center of the frame)

CENTER_LONGITUDE (real <0,360 degree>)

The center_longitude element provides a reference longitude for certain map projections. For example, in an Orthographic projection, the center_latitude along with the center_longitude defines the point of tangency between the sphere of the planet and the plane of the projection. The map_scale (or map_resolution) is typically defined at the center_latitude or center_longitude. For unprojected flight images, center_longitude refers to the longitude at the center of the frame.

VICAR = LON (real <0,360>)
Longitude of center of frame.

Catalog = C_LON (real <degree>)
West longitude of p5 point (p5 represents the center of the frame)

CENTER_RING_RADIUS (real <0,1000000000.0>)

The center_ring_radius element applies to images of planetary rings only. It is the radius of the ring element which passes through the center of the image.

VICAR = RAD (real 12 <0,1000000000.0 km>)
Ring radius of center of frame

Catalog = MEAN_RAD (real)

SOLAR_DISTANCE (real <0,1.E32 km>)

The solar_distance element provides the distance from the center of the sun to the center of the target body.

VICAR = SOLRANGE (real 12 <0,1000000000.0 km>)
Distance from sun to target-body

Catalog = n/a

SUB_SOLAR_LATITUDE (real <-90,90 degree>)

The sub_solar_latitude element provides the latitude of the subsolar point. The subsolar point is that point on a body which lies directly beneath the sun.

VICAR = n / a

Catalog = SUN_LAT (real <degree>)
Planetocentric subsolar latitude.

SUB_SOLAR_LONGITUDE (real <-90,90 degree>)

The sub_solar_longitude element provides the longitude of the subsolar point. The point is that on a body which likes directly beneath the sun.

VICAR = n/a

Catalog = SUN_LON (real <degree>)
Subsolar west longitude

SUB_SOLAR_AZIMUTH (real <0,360 degree>)

The sub_solar_azimuth element provides the value of the angle between the projected solar vector and a horizontal reference line (in the image plane) extending from the image center to the middle right edge of the image. The values of this angle increase in a clockwise direction.

VICAR = SUNAZ (real <0,360.0>)
Sun azimuth - the angle between the projected solar vector and the horizontal reference line.

Catalog = n/a

INCIDENCE_ANGLE (real<0-180.0 degree>)

The incidence_angle element provides a measure of the lighting condition at the intercept point. Incidence angle is the angle between the local vertical at the intercept point (surface) and a vector from the intercept point to the sun. The incidence_angle varies from 0 degrees when the intercept point coincides with the subsolar point to 90 degrees when the intercept point is at the terminator (i.e., in the shadowed or dark portion of the target body). Thus higher values of the incidence_angle indicate the existence of a greater number of surface shadows.

VICAR = INA (real <0,180.0>)
Incidence angle

Catalog = INCIDENCE (real <0.0,360.0>)
Incidence angle at p5 point (p5 represents the center of the frame).

EMISSION_ANGLE (real <0,180 degree>)

The emission_angle element provides the value of the angle between the surface normal vector at the intercept point and the vector from the intercept point to the spacecraft. The emission_angle varies from 0 when the spacecraft is directly over the target area (nadir viewing) to 90 degrees when the intercept is tangent to the surface of the target body. Thus, higher values of emission_angle indicate more oblique viewing of the target. Values in the range of 90 to 180 degrees are possible for ring data.

<u>VICAR = EMA (real <0,180.0>)</u>
Emission angle

Catalog = EMISSION (real <0.0,360.0>)
Emissions angle at p5 point (p5 represents the center of the frame).

PHASE_ANGLE (real <0,180 degree>)

The phase_angle element provides a measure of the relationship between the spacecraft viewing position and incident solar light. Phase_angle is defined as the angle between a vector from the intercept point to the sun and a vector from the intercept point to the spacecraft. Low values of phase angle indicate lighting from behind the spacecraft. Phase angle varies from 0 degrees, when the sun is directly behind the spacecraft, to 180 degrees when the sun is opposite the spacecraft.

<u>VICAR = PHA (real <0,180.0>)</u>
Phase angle

Catalog = PHASE (real <0.0,360.0>)
Phase angle at p5 point (p5 represents the center of the frame).

LOCAL_HOUR_ANGLE (real <0,360 degree>)

The local_hour_angle element provides a measure of the instantaneous apparent sun position at the subspacecraft point. The local_hour_angle is the angle between the extension of the vector from the Sun to the target body and the vector projection on the target body's ecliptic plane of a vector from the target body's Planetocentric center to the observer (usually, the spacecraft). This angle is measured in a counterclockwise direction when viewed from north of the ecliptic plane. It may be converted from an angle in degrees to a local time, using the conversion of 15 degrees per hour, for those planets for which the rotational direction corresponds with the direction of measure of the angle.

VICAR = HRA (real <0,360.0>)
Hour angle (0,360.0) measured clockwise from a positive x-axis (p5 - p6 direction).

Catalog = HOUR_ANGLE (real)
Hour angle at p5 point (p5 represents the center of the frame).

A_AXIS_RADIUS (real <0,1.E32 km>)

The a_axis_radius element provides the value of the a_axis of a solar system body . The a_axis is the semimajor axis of the ellipsoid that defines the approximate shape of the body.

VICAR = n / a

Catalog = n/a

B_AXIS_RADIUS (real <0,1.E32 km>)

The b_axis_radius element provides the value of the b_axis of a solar system body. The b_axis is the intermediate axis of the ellipsoid which defines the approximate shape of the body.

VICAR = n / a

Catalog = n/a

C_AXIS_RADIUS (real <0,1.E32 km>)

The c_axis_radius element provides the value of the c_axis of a solar system body. The c_axis is the intermediate axis of the ellipsoid which defines the approximate shape of the body.

VICAR = n / a

Catalog = n/a

MEAN_RADIANCE (real <0,10^{16}>)

The mean_radiance element applies to images that have been radiometrically corrected. If the output DNs are in units of radiance, then the mean_radiance is the mean DN value of the image.

<u>VICAR = n / a</u>

Catalog = MEAN_RAD (real)

MEAN_REFLECTANCE (real<-32768,32767>)

Mean reflectance of the imaged area of the target-body in I over F units (Intensity over Flux), where 10,000 I over F units would be produced by normal incidence of sunlight on a Lambert disk at the target-body's distance from the sun.

<u>VICAR = n / a</u>

Catalog = MEAN_IOF (real)

REFLECTANCE_SCALING_FACTOR (real <0,1.0>)

The reflectance_scaling_factor is the conversion factor from DN to reflectance.

<u>VICAR = IOF (real <0,1.0>)</u>
Conversion factor from DN to reflectance (values from 0 to 1.0).
The reflectance of the imaged area of the target-body is recorded in units of "I over F", where 10,000 I over F units would be produced by normal incidence of sunlight on a Lambert disk at the target-body's distance from the sun.

Catalog = IOF (real)

RADIANCE_SCALING_FACTOR (real <0,10^{16}>)

The radiance_scaling_factor element provides the conversion factor from DN to radiance.

<u>VICAR = CNV (real <0,999999.0>)</u>
Conversion factor from DN to radiance 0 to 999999.0

Catalog = CNV (real)

UNEVEN_BIT_WEIGHT_CORR_FLAG (character 3)

The uneven_bit_weight_corr_flag indicates whether a correction has been applied to adjust for uneven bit weighting of the analog-to-digital converter. The correction is applied to every pixel in the image.

VICAR = UBWC (character 3)
Uneven-bit-weight correction (ON or OFF).

Catalog = UBWC (character 3)

DARK_CURRENT_FILE_NAME (character 20)

The dark_current_file_name element indicates the dark current image file (an image taken without opening the camera shutter) which was used to perform radiometric calibration of this image. The dark current image provides a measure of the reference pedestal and thermally generated charge build-up on the sensor. The dark-current is subtracted from the image to isolate the signal due to the imaged target. Selection of the appropriate dark current image may be based on time, camera, temperature, readout conditions, light flood, gain and offset.

VICAR = DC (character 20)

Catalog = DC_FILE (character 20)

SLOPE_FILE_NAME (character 20)

The slope_file_name element provides the file containing corrections for the variances in responsitivity (shading) across the field-of-view of the sensor.

VICAR = CAL (character 20)

Catalog = CAL_FILE (character 20)

BLEMISH_FILE_NAME (character 20)

The blemish_file_name element provides the file which provides corrections for camera blemishes (reseaus, dust spots, etc.) which affect the responsitivity of the sensor. The blemish file is selected based on camera, filter, gain-state, camera mode, and time. Note: Galileo does not have reseaus.

VICAR = BLM (character 20)

Catalog = BLEM_FILE (character 20)

SHUTTER_OFFSET_FILE_NAME (character 20)

The shutter_offset_file_name provides the file which contains the corrections for discrepancies between commanded and actual shutter times. Because the shutter blades travel in a vertical direction, offsets in actual exposure is a function of image line number.

VICAR = SO (character 20)

Catalog = SO_FILE (character 20)

EDR_TAPE_ID (character 7)

The edr_tape_id element indicates the volume identifier of the Experiment Data Record (EDR) tape on which the image data file was originally recorded.

VICAR = EDRTAPE (character 7)

Catalog = EDR_ID (character 12)

EDR_FILE_NUMBER (integer <1,100>)

The edr_file_number element indicates the file position of the image when it was originally recorded on the Experiment Data Record (EDR) tape.

VICAR = EDRFILE (integer <1,100>)

Catalog = EDR_FILENUM (signed word)

DATA_TYPE (character 30 - 20)

The data_type element indicates the data storage representation of sample value. Data_type indicates whether 8-bit (byte) or 16-bit integer representation is used. 8-bit integers are represented as "LSB_UNSIGNED_INTEGER," and 16-bit integers are represented as "LSB_INTEGER". For 16-bit, the byte order (LOW, HIGH - byte order, VAX "LOW", SUN is "HIGH") is indicated.

VICAR = n / a

Catalog = n/a

SOURCE_PRODUCT_ID (character 40 <S,P,I,C,E>)

The spice_file_name element identifies the file name of the kernel used in creating/updating record data.

VICAR = n/a

Catalog = SPICE_S_ID (character 4)
SPICE_P_ID (character 4)
SPICE_I_ID (character 4)
SPICE_C_ID (character 4)
SPICE_E_ID (character 4)
Version of kernel used in creating/updating record and filename

PROCESSING_HISTORY_TEXT (character 80)

The processing_history_text element provides the concatenation of VICAR programs (task names) run on the input file.

VICAR = n/a

Catalog = n/a

PRODUCT_TYPE (character 4)

The product_type element is a PDS keyword pending inclusion into the next version of PSDD with the modifications to include EDR, UDR, REDR.

VICAR = n/a

Catalog = n/a

E.2 Quick Reference Guide

The following is a Quick Reference Guide provided to enable mapping PDS, VICAR and MIPS Galileo SSI catalog keywords to each other. This can also be used as an index to the Glossary; the Quick Reference Guide also follows the PDS Label sequence.

PDS Label Item	VICAR Label Item(s)	Catalog Item(s)
DATA_SET_ID	n/a	n/a
SPACECRAFT_NAME	MISSION	n/a
INSTRUMENT_NAME	SENSOR	n/a
SPACECRAFT_CLOCK_START_COUNT	RIM MOD(91)	SCLK
IMAGE_TIME	SCETYEAR SCETDAY SCETHOUR SCETMIN SCETSEC SCETMSEC	SCET_YEAR SCET_DAY SCET_HOUR SCET_MINUTE SCET_SECECOND SCET_MILLI
IMAGE_ID	PICNO	PICNO
ORBIT_NUMBER	n/a	ORBIT_NUMBER
OBSERVATION_ID	PA	ACTIVITY_ID
TARGET_NAME	TARGET	TARGET
TIME_FROM_CLOSEST_APPROACH	TCA	TCA
SATELLITE_TIME_FROM_CLST_APR	n/a	TCA_SAT
NOTE	n/a	n/a
FILTER_NAME	n/a	PRED_FILTER FILTER
FILTER_NUMBER	FILTER	n/a
EXPOSURE_DURATION	EXP	PRED_EXPOS EXPOS_TIME
GAIN_MODE_ID	GAIN	PRED_GAIN GAIN_STATE
FRAME_DURATION	RATE	PRED_IMAGING IMAGING_MODE
LIGHT_FLOOD_STATE_FLAG	**F**IBE	LIGHT_FLOOD
EXPOSURE_TYPE	FIB**E**	EXPOS_MODE
BLEMISH_PROTECTION_FLAG	FI**B**E	BLEM_PROTECT
INVERTED_CLOCK_STATE_FLAG	F**I**BE	CLOCK_STATE

ENCODING_TYPE	BARC	COMP_MODE
ENTROPY	ENTROPY	ENTROPY
MEAN_TRUNCATED_BITS	TBPPXL	TBITS_PIXEL
MEAN_TRUNCATED_SAMPLES	TPPLNE	TPIXELS_LINE
TELEMETRY_FORMAT_ID	TLMFMT	PRED_TLMFMT TLMTRY_FMT
OBSTRUCTION_ID	BOOM	BOOM_OBS
POSITIVE_LONGITUDE_DIRECTION	n/a	n/a
TARGET_CENTER_DISTANCE	n/a	SC_TGT_RANGE
CENTRAL_BODY_DISTANCE	PLRANGE	SC_CB_RANGE
SUB_SPACECRAFT_LATITUDE	n/a	SC_LAT
SUB_SPACECRAFT_LONGITUDE	n/a	SC_LON
TWIST_ANGLE	TWIST	TWIST
CONE_ANGLE	CONE	CONE_POS
RIGHT_ASCENSION	RA	RA
DECLINATION	DEC	DEC
SUB_SPACECRAFT_LINE	n/a	n/a
SUB_SPACECRAFT_LINE_SAMPLE	n/a	n/a
NORTH_AZIMUTH	NORAZ	n/a
SUB_SPACECRAFT_AZIMUTH	SCAZ	n/a
SMEAR_AZIMUTH	SMRAZ	n/a
SMEAR_MAGNITUDE	SMEAR	SMEAR_MAG
HORIZONTAL_PIXEL_SCALE	HSCL	n/a
VERTICAL_PIXEL_SCALE	VSCL	n/a
SLANT_DISTANCE	SLRANGE	SLANT_RANGE
CENTER_LATITUDE	LAT	C_LAT
CENTER_LONGITUDE	LON	C_LON
CENTER_RING_RADIUS	RAD	MEAN_RAD
SOLAR_DISTANCE	SOLRANGE	n/a
SUB_SOLAR_LATITUDE	n/a	SUN_LAT
SUB_SOLAR_LONGITUDE	n/a	SUN_LON
SUB_SOLAR_AZIMUTH	SUNAZ	n/a
INCIDENCE_ANGLE	INA	INCIDENCE

EMISSION_ANGLE	EMA	EMISSION
PHASE_ANGLE	PHA	PHASE
LOCAL_HOUR_ANGLE	HRA	HOUR_ANGLE
A_AXIS_RADIUS	n/a	n/a
B_AXIS_RADIUS	n/a	n/a
C_AXIS_RADIUS	n/a	n/a
MEAN_RADIANCE	n/a	MEAN_RAD
MEAN_REFLECTANCE	n/a	MEAN_IOF
REFLECTANCE_SCALING_FACTOR	IOF	IOF
RADIANCE_SCALING_FACTOR	CNV	CNV
UNEVEN_BIT_WEIGHT_CORR_FLAG	UBWC	UBWC
DARK_CURRENT_FILE_NAME	DC	DC_FILE
SLOPE_FILE_NAME	CAL	CAL_FILE
BLEMISH_FILE_NAME	BLM	BLEM_FILE
SHUTTER_OFFSET_FILE_NAME	SO	SO_FILE
EDR_TAPE_ID	EDRTAPE	EDR_ID
EDR_FILE_NUMBER	EDRFILE	EDR_FILENUM
DATA_TYPE	INTFMT	REALFMT
SOURCE_PRODUCT_ID	n/a	SPICE_S_ID SPICE_P_ID SPICE_I_ID SPICE_C_ID SPICE_E_ID
PROCESSING_HISTORY_TEXT	n/a	n/a
PRODUCT_TYPE	n/a	n/a